MAY 1956

plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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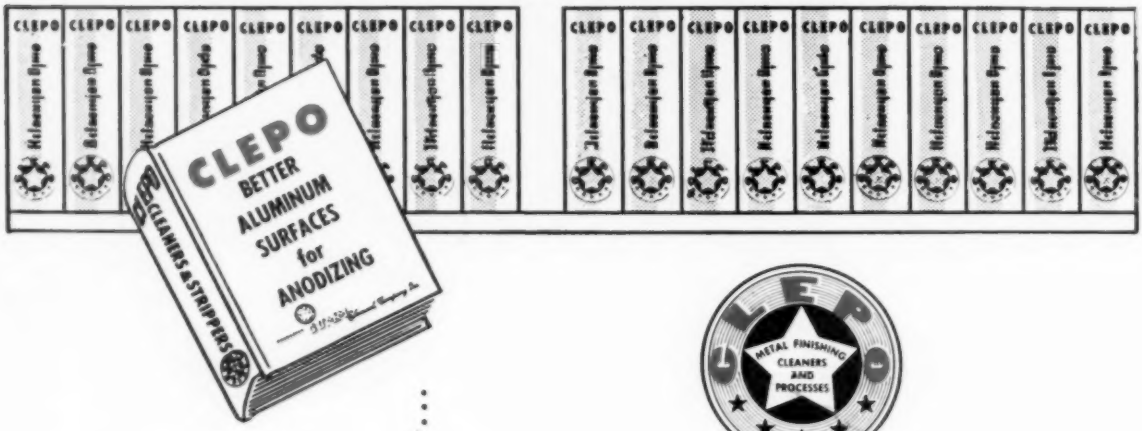

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CLEPO Field Men have a thorough understanding of anodizing operations and of surface preparation problems in connection with anodizing. By all means call on them for service. And, as is implied by the above partial list of CLEPO Products, they have many formulations from which to select to take care of your specific requirements.

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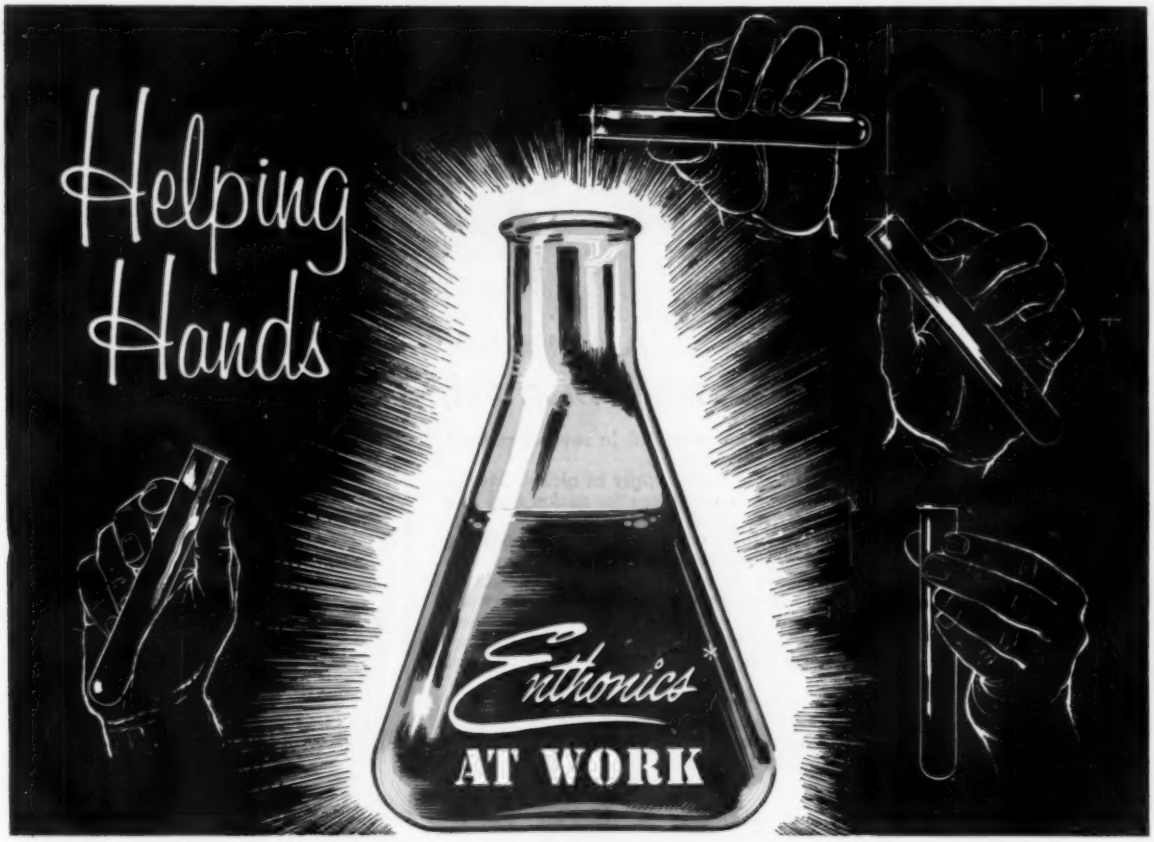

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THE FINISHING TOUCH

by A. B. HOEFER
vice president
FREDERIC B. STEVENS, INC.

Will Anodized Aluminum Replace Nickel-Chrome Finishes?

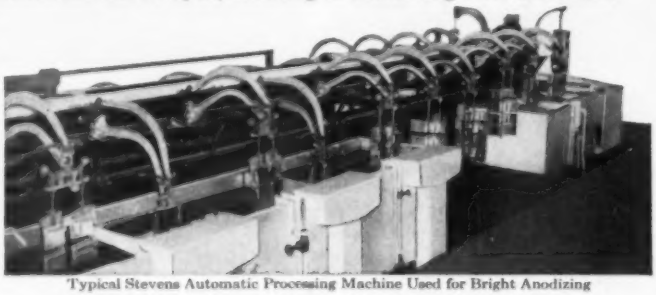
Affirmative answers to this question are revealed in several current business publications and our own sales figures.

Speeding the change is the continued tight supply of nickel. Manufacturers have been forced to look for substitutes for nickel and like the results anodized aluminum have given them.

A trend is developing. Volume of Stevens Automatic anodizing equipment sold in 1955 was nearly double the volume for the two preceding years. At the same time, sales of Stevens compositions used in buffing and polishing aluminum were showing a 50% increase.

Frederic B. Stevens, Inc., manufacture equipment for both nickel-chrome and aluminum finishes. We believe both types of finishes will increase in demand but at the moment the interest in aluminum is high.

If you are considering aluminum for your product, you can be assured that aluminum parts can be bright anodized and finished to compare favorably with the fine finish of chrome plate. In addition, aluminum can be dyed, resulting in non-fading colored finishes.



Typical Stevens Automatic Processing Machine Used for Bright Anodizing

Stevens aluminum anodizing equipment is presently being used and recommended in the finishing of colored anodized tumblers, utensils, refrigerator components, rivets, automotive trim, lighting reflectors, etc.

Stevens' experience in furnishing complete anodizing equipment installations assures you of the latest techniques—the finest finishes—at the lowest costs.

For long range planning consider the versatility of Stevens Automatic equipment. Changes of cycles or processes can be accomplished quickly and inexpensively. Your Stevens Automatic Processing Machine for anodizing can be changed to a nickel-chrome cycle at a later date.

If your design engineers are talking of aluminum to add sales appeal excitement, cost reducing features to your new product lines, let us discuss your requirements with you.

For further information write to Frederic B. Stevens, Inc., Detroit 16, Michigan.

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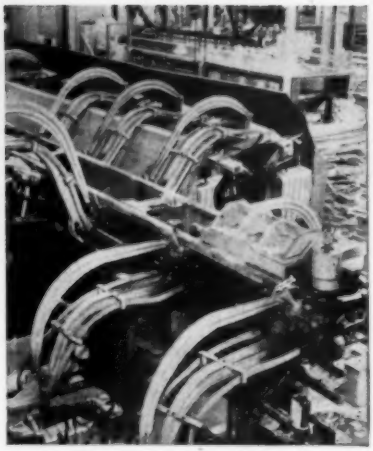
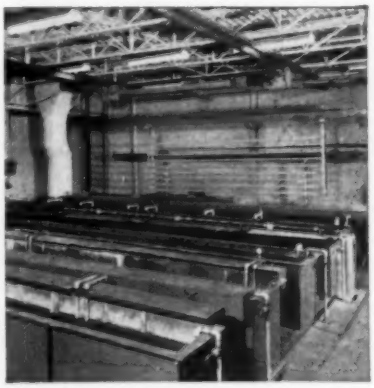
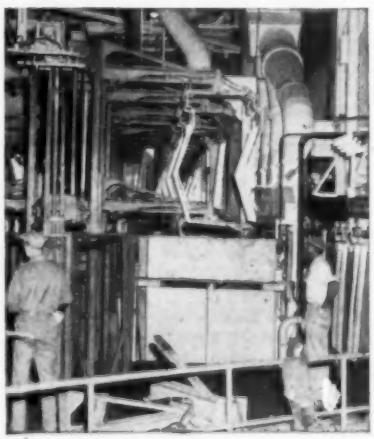


Stevens Model "B" Automatic Processing Equipment used in anodizing refrigerator evaporators.



Stevens Still Tank installation for anodizing extruded architectural and aircraft parts.



Automatic "Stevadoer" used in anodizing grille sections for leading automotive manufacturer.

An Educational Society for the Advancement of the Science of Electroplating, the Finishing of Metals and Allied Arts

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SOCIETY of BUSINESS MAGAZINE EDITORS

plating

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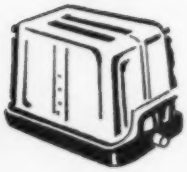
HARSHAW Nubrite

bright nickel plating process



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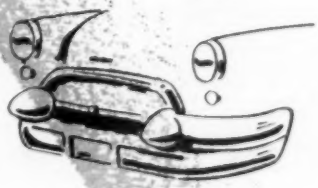

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EDITORIAL

EDUCATION FOR THE ELECTROPLATING AND METAL FINISHING INDUSTRY

The spotlight of public attention is currently on the relatively low output of engineers and technical personnel in this country. This dearth of personnel also prevails in the electroplating and metal finishing industry where training facilities available to those working in the industry have remained static in recent years.

Our industry depends almost exclusively upon "on-the-job" training in developing its engineers, supervisors, development staffs and skilled workers. The training process, however, can be accelerated and made more complete when it is supplemented by formal educational courses.

According to a recent survey, the educational facilities for training electroplaters available in this country are relatively poor with little recent activity while plating education is much more widespread and intensive in Germany and England. The time is ripe for a considerable expansion in the educational training facilities for platers in the U.S.A.

To improve this situation, Industry, Management and Labor must encourage employees to take advantage of educational opportunities and reward and upgrade those finishing these courses.

Technical societies traditionally take a direct and active interest in furthering the education of those working or preparing to work in their particular fields.

The AES should promote, more actively, the education of those working in the industry. The AES should sponsor and correlate educational activities in providing suitable facilities, publicity and instructors.

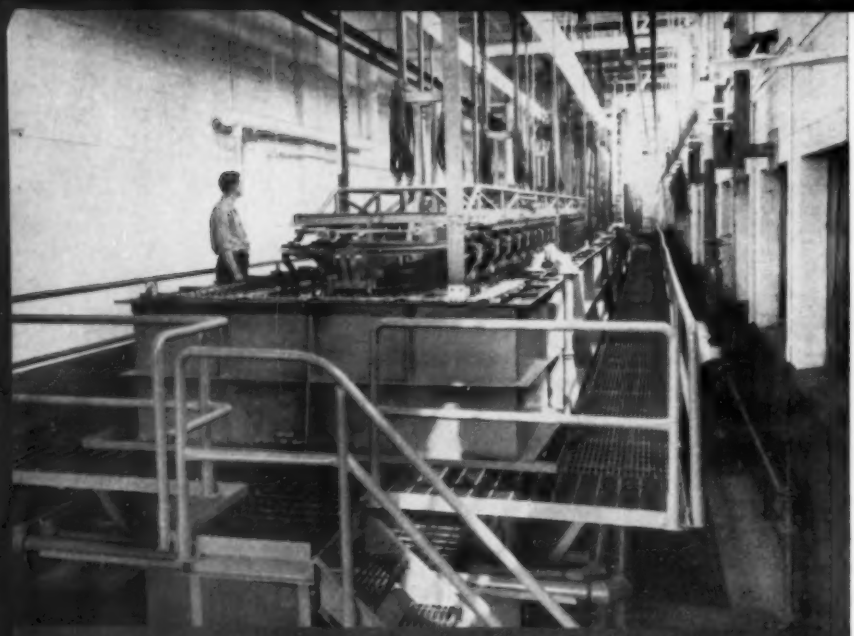
AES Headquarters has recently distributed to all branch officers a comprehensive report on the "Organization and Maintenance of a Course in Electroplating and Metal Finishing."

Branch officers can further the basic aims of the AES as an educational society in no better way than by sponsoring and providing an educational program in their area. This matter is of such importance that the branch president himself should take the lead.

The time to do something about further educating the plater is TODAY.

Samuel Heiman

First Vice-President, AES
and National Educational Chairman



MAINTAINING THE PACE OF MASS PRODUCTION

This Udylite Machine Cleans, Plates and Processes 480 Auto Grilles per hour AUTOMATICALLY

A complete production operation—applying nickel-chrome plate to steel radiator grilles—is handled by three men and this Udylite machine. The entire operation of cleaning, plating and rack strip are handled by the machine—the loading and unloading of parts are the only manual operations. The stampings are approximately 8″ x 36″ in size and to assure them of a flawless finish Udylite installed a Horizontal Cathode Agitator. In addition, a high current density chrome strike is applied before the chrome plate.

This is just one more example of how Udylite machines are meeting the pace of mass production. And Udylite machines are adaptable to practically any metal finishing operation you can name. Why don't you find out more about how Udylite can fit into your operations? Just call your nearby Udylite representative or write direct for the full details. There's no obligation.

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WORLD'S LARGEST PLATING SUPPLIER

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UDYLITE OVERSEAS

Clichy, France

The industry of home appliances has considerably developed in France during 1955 and a good deal of firms have now erected large electroplating installations. In most cases, of course, the bright nickel plating process is used.

In view of the high quality required, the parts are copper plated and buffed before being coated with a Udylite Bright Nickel deposit in the order of 15 microns. For more safety, a copper flash is used on the parts which have been copper plated and buffed prior to nickel plating.

It is evident that the use of the Udylite techniques enables the firms to increase the quality of their plating and to fight effectively against the high competition they meet in France.

Rotterdam, Holland

The addition of Zero-Mist to chromium plating baths makes it possible to omit the exhaust and thus results in great advantages. Consequently, we contacted the Labor Inspection in our country after having put into use the first Zero-Mist baths.

Together with a few chemists of the Labor Inspection we visited a number of our clients who were adding Zero-Mist to their chromium baths and took the necessary air samples above the baths. We thus obtained sufficient data to establish the content of chromic acid in the air above chromium baths *without Zero-Mist* and *with a normal exhaust system* and to compare this data with the air samples we took above baths *with Zero-Mist* and *without exhaust.*

It appeared after analysis of those air samples, which had been taken on various heights above the liquid surface, that Zero-Mist could not only be considered a complete substitute for exhaust, but also far better and more effective.

These experiments were only made, however, in factories where a well functioning exhaust was available. The air samples taken near baths with exhaust and without Zero-Mist appeared to contain 5 to 20 times more chromic acid than the air samples which were taken after the addition of Zero-Mist.

The addition of Zero-Mist to chromium baths has been semi-officially allowed and other experiments are being taken at 20 other customers.

If the results are successful we shall no doubt be given full permission by the Dutch Labor Inspection to use Zero-Mist in place of exhaust.

Milan, Italy

The Udylite Bright Nickel Process was only introduced into Italy in 1950. Before then brighteners of other origins were used, but results were generally unsatisfactory and their use limited.

INDICATE A 504.

(*Advertisement*)

The introduction of the Udylite Brighteners proceeded rapidly, facilitated by the experience already gained in other countries.

Our main customers who have experimented with Brightener No. 41 recognize its greater levelling qualities and, particularly, the greater tolerance to contamination from zinc and copper.

Johannesburg, South Africa

Udylite processes were introduced in South Africa for the first time approximately a year ago when a small bright nickel bath was installed—a tank of approximately 270 gallons. Since that time we have made considerable progress and at the date of this news letter we have 6,000 gallons of Udylite Bright Nickel tanks in operation. We also have several chromium plating tanks operating with Zero-Mist, and these have justified the claims made for this product in every respect.

The electroplating industry in South Africa has made great progress during the last few years and has greatly benefited by the up-to-date methods and processes used in England and America.

CONTROL OF CHROMIC ACID MIST

Zero-Mist, the new surface-active additive for chromium plating solution control has been given enthusiastic approval by chromium platers. This new product has not only shown dollar savings to platers but has greatly improved health conditions in the plating room.

Udylite Zero-Mist is a completely stable, surface-active additive for decorative chromium plating baths which eliminates the usually troublesome mist and spray. When Zero-Mist is added, a thin curtain of foam forms at the surface of the solution which contains the mist and spray which are evident when Zero-Mist is not used.

While Udylite does not recommend elimination of proper ventilation in any chromium plating operation, there are reports of many platers using Zero-Mist successfully without washing the exhausted air. Zero-Mist has also proved to be of great benefit in plating rooms where wide tanks are difficult to ventilate, late, or where tanks of normal width are located near windows or doors, since it prevents the blowing of mist and spray due to the cross-currents of air.

From the dollar standpoint, Zero-Mist has shown remarkable savings to platers. Losses of chromic acid from mist and spray in the solution can amount to as much as 40 per cent. When dragout losses are also included, tests have shown Zero-Mist to cut chromic acid waste up to 70 per cent.

ELIMINATE THE WORK HAZARDS OF CHROMIC ACID MIST AND SPRAY

. . . use ZERO-MIST

The health hazard caused by mist and spray from chromic acid plating bath solution is eliminated when you use Udylite's Zero-Mist. Employees like it. City and state labor and health authorities like and recommend it. It is a boon to labor relations.

Beside eliminating mist and spray and improving working conditions, there are these direct benefits to your profitable operations—Saving the losses of valuable chromic acid in mist and spray—Additional large savings in the reduction of dragout losses—No need for water wash system installations—Gives added life to ventilating systems—Protects other solutions from mist and spray contamination.

Zero-Mist is a stable, surface-active additive for decorative chromium plating baths. It is unaffected by high temperatures. The concentration of Zero-Mist stays practically constant.

Zero-Mist is today a *must* in many plating operations. It will pay you to try it. Write us today for a test sample.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

COVER STORY

Reminders Are Things We Live By

The familiar note pad that appears on our cover this time is a tool by which we jog our memory and manage more often than not to keep our crowded days in some sort of order. But the note that has been recorded, this time, carries a monumental implication and a promise of the future.

Between June 17 and 21, nearly all members of the AES must by now be aware, a great convention is scheduled to take place in our nation's capital. Listed here are a few of the records already established: some 41 papers have been submitted; more than 65 authors are involved; the papers will be presented at ten sessions (see schedule in this issue). The authors are all leaders in their fields and, for the most part, serious scientists. The papers add much to the fund of knowledge of our industry. Every person involved in any phase of the finishing of metals, plating, or the end-use of manufactured materials owes it to himself as well as to his business to supplement and increase the knowledge by which he can achieve leadership and stay abreast of our swiftly progressive industry.

At no time since the start of the industrial revolution has man developed and put to use so much knowledge and information as now. Progress in the sciences has reached a point in the graph which is almost perpendicular. This implies in itself that we owe it to ourselves as businessmen and scientists to attempt to take advantage of progress. On the other hand, our social duty toward the new world that we have been creating by the application of scientific principle becomes more obvious with every passing day. Each individual member of the AES has been conscious of this social duty. The matter becomes obvious from the simple fact that they joined the Society in the first place. They are conscious of the implication of their work and have thus banded together to make more effective the products of their minds and their hands.

The need to be well armed with knowledge and information of new developments in an infant science like ours is synonymous with the need for breathing in order to sustain life. In Washington between June 17–21 will take place a most significant meeting of minds. Here will gather together the men who are developing the latest theories, approaches, methods, hypotheses, and approaches to the finishing of metals and myriad problems brought about by a restless science.

We owe it to ourselves, to each other, to our industry, to society, indeed to all the future generations that will follow us to attend the 43rd Annual AES Convention in Washington, D. C. between June 17–21. Let our cover act as a reminder.

See you in Washington in June.

THE EDITOR

• • •

It may be of some interest to know that the art for our cover was accomplished by Isaiah Williams (who also preseperated the colors!). It is a three-color pencil rendering that was purposely kept simple in an effort to capture the sparkle of simplicity and to enhance the message that we should all meet in Washington in June. Engravings by Essex Art Engraving of Newark, N. J., and the precise register attests to their right to include the word "art" in their name.

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IMMERSION HEATER
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for FAST,
LOW COST,
OPERATIONS
• CORROSION RESISTANT
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Because this will extend your Nickel supply and maintain the ultimate quality.

Lavin specializes in the manufacture of high purity anodes for all electrodeposition products. This minimizes the buildup of undesirable trace elements in the plating solution. These trace impurities can cause subtle, but definite, corrosion problems in the finished product out in the field.

Lavin's metallurgical staff is always ready to assist you in finding the solution of any routine or special electroplating problem. Our chemical and research laboratories are available to you at no cost or obligation. Technical information furnished upon request.

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REPRESENTATIVES IN PRINCIPAL CITIES

Fine Art on Aluminum

Vitreous Enamel on Aluminum—A colorful new product is making its appearance on the American market. Vitreous enamel on aluminum. Pioneered in 1953 by Edward Winter, Cleveland ceramic artist, it is now styled and designed for commercial sale.

First showing will be at J. E. Caldwell & Co., Philadelphia, Pa., latter part of April. It will then be shown in Boston, New York, Cincinnati and Cleveland with western bookings for early fall.

This work is fired at 1,000° F for a period of 6 minutes. Colors are made by milling metallic oxides into aluminum low temperature frit. The artist has left the back sides of the small bowls plain metal and given them a high buffing, so much so that the designs on the plates beneath them reflect in the bowls.

The first work of this artist was featured last summer at Royal Festival Hall, London, England and later at Wolverhampton and Birmingham by the Aluminum Development Ass'n of Great Britain. The Philadelphia showing will be the first in this country.

This pioneering work was done in the laboratory of the Ferro Corporation, Cleveland, Ohio.

Work is on 16 gauge aluminum. Colors, lemon yellow, turquoise, white, black, red and gold.

Service Buttons Presented at Wyandotte

Reps Receive Service Buttons—Shown left to right are P. N. Burkard, manager Wyandotte Chemicals Industrial, Railroad and Aircraft Department; A. J. Bettleheim, district sales manager, New York City; Emil Haas, New York, who received a 25 year, 1 diamond service button; George Haas, Boston and James Hubbard, district sales manager, Boston. The Haas brothers are well known in the metal finishing industry, and have devoted nearly 35 years to servicing Wyandotte Chemicals customers.

All Wyandotte Chemicals representatives with the company more than 5 years are now wearing service buttons which were presented during the recent regional sales meetings. Various color combinations plus diamonds indicate years of service. Burkard, Bettleheim and Hubbard shown above have Wyandotte Chemicals service totaling over 40 years.

Six Representatives—The appointment of six new manufacturers' representatives has been announced by the Permacel Tape Corporation of New Brunswick, N. J.

The new representatives are: For the New Jersey and New York area—R. L. Gentry of the RSA Company, 15 Park Avenue, Rutherford, N. J. For Iowa, Nebraska, Kansas, Missouri and Southern Illinois—H. W. Knaggs, 7503 Melba Lane, Belleville, Ill. For Wisconsin and Northern Illinois—L. A. Chambers Co., 5906 W. North Avenue, Chicago, Ill. For Southern New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia and Virginia—Edward Braddock, Browning Lane, Haddonfield, N. J. For Michigan—Jack Thorpe, 640 Hidden Lane, Detroit, Mich. For Kentucky, Ohio, West Pennsylvania, West Virginia—Near Bear Corporation, 3435 Streetsboro Road, West Richfield, O.

AIM Gives Award—After a thorough analysis of corporate operation, the American Institute of Management has awarded The Diversey Corporation an Award for Excellent Management.

The formal report, issued by the Institute, notes Diversey's rise to a position of major importance in the manufacturing of sanitation chemicals for use in food processing, food serving and metal processing industries. This report also touches on some of the major reasons for this leadership. "Inspection of Diversey's research and development facilities disclose both modern facilities and an atmosphere conducive to this type of endeavor . . . further than this, however, the company meets a high standard in the quality of its research personnel which the Institute considers the most single factor in any research endeavor."

Lewis Shere, president of The Diversey Corporation, receives his company's award for excellent management for 1955 from Jackson Martindell, president of the American Institute of Management

The report goes on to say, "The pulse of the entire Diversey Corporation is its sales division, and this division is one of the best integrated and well operated sales groups which the Institute has examined in an organization of Diversey's size and type."

NEW CONTINUOUS LINE OPENS AT J & L

New Galvanizing Line—Start of production on its new $6,250,000 continuous hot-dip galvanizing line here has been announced by Jones & Laughlin Steel Corp.

C. L. Austin, J&L president, said that the new galvanizing line, which utilizes the Armco-Sendzimir process, has a rated capacity of 7000 to 8000 tons of galvanized sheets a month.

The new facility is another step in the latest phase of J&L's improvement and expansion program. Last October, J&L announced it would spend $250,000,000 in the 1955–1958 period.

The line is housed in an L-shaped building, 750 feet long and 100 to 175 feet wide. In addition to the line, the building contains a coil storage area (110 ft x 175 ft; the warehouse and shipping department (650 ft x 75 ft); and office, maintenance and control areas (190 ft x 34 ft).

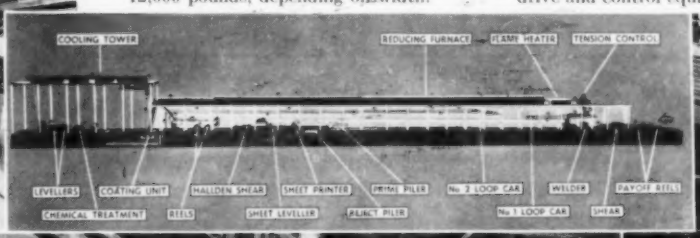
The mill is producing galvanized steel both in sheets and in coils. The line is able to produce to the following specifications: galvanized sheet gages—14 to 30; widths—20 in to 48 in (with coated edge); lengths—60 in to 168 in; coatings—the flexibility of the line permits a full range of industrial coatings; coil diameters—id 20 in and 24 in; od 48 in maximum; coil weights—maximum with no welds 12,000 pounds, depending on width.

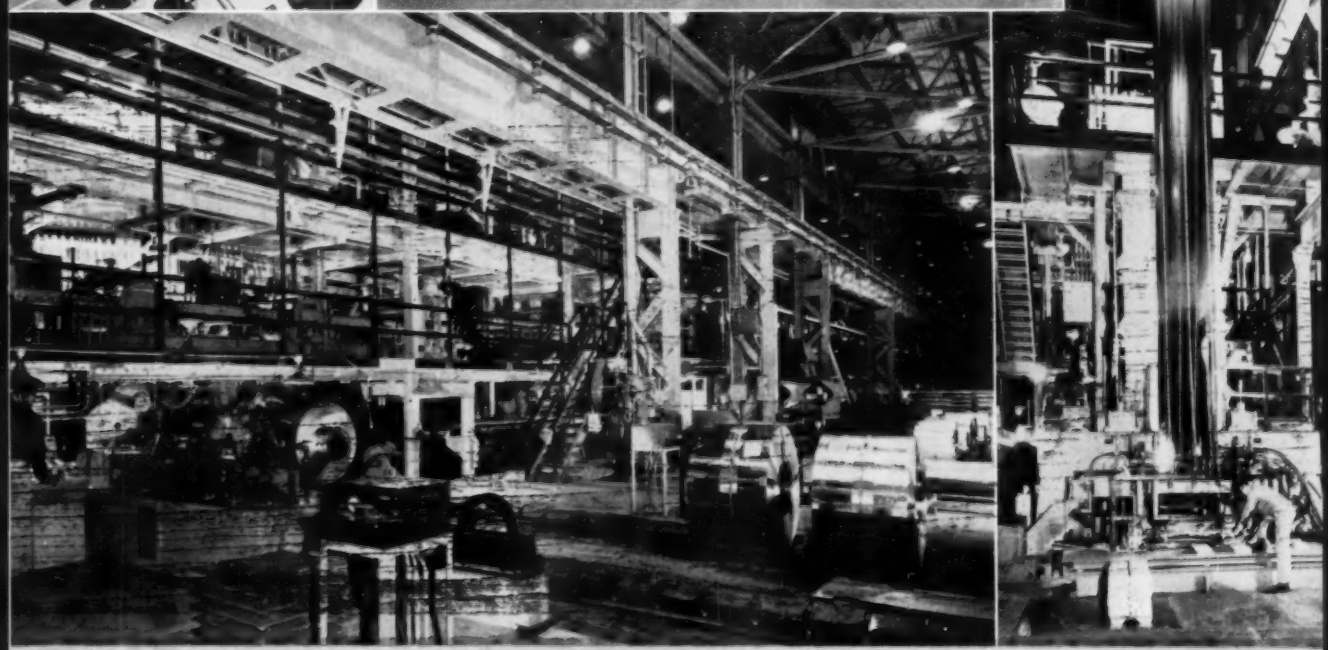
The line will operate for 13 weeks continuously before it is shut down for drossing (removing the wastes from the bottom of the pot) and maintenance.

The galvanizing department's raw material, in the form of cold-rolled steel bands, is delivered from the adjoining continuous sheet mill.

S. A. Ambler is general foreman of the Continuous Galvanizing Department.

The mill was built by Aetna-Standard Engineering Company, the prime contractor on the project. They contracted the installation of the mill to Eichleay Corporation; erection of the building and installation of electrical equipment to Patterson-Emerson-Comstock, Inc., and the design and installation of the furnaces to the Electric Furnace Company. General Electric Company furnished all the drive and control equipment.





At left: The entire length of the $6,250,000 Jones & Laughlin Steel Corporation Continuous Galvanizing Line can be controlled from this one point. Here, Fred J. Pettit, Operator, instructs line personnel by means of a two-way intercom set

Left bottom: The photograph above is a scale model of Jones & Laughlin Steel Corporation's new Continuous Galvanizing Line. In the operation, the sheet steel enters the line at the payoff reels (on the far right) and then goes through the following: Shear, Welder, No. 1 Loop Car, Tension Control, Flame Heater, Reducing Furnace, Coating Unit, Cooling Tower, Levellers, Chemical Treatment, and No. 2 Loop Car. Galvanized sheets shipping as coils then go to the reels while galvanized shipping as cut-length sheets go through the Hallden Shear, Sheet Leveller, Sheet Printer, and are piled on the Prime Piler

At Center: Jones & Laughlin Steel Corporation's new Continuous Galvanizing Line, which went into operation at the Corporation's Pittsburgh Works earlier this year, utilizes the most modern processes and facilities in the galvanizing line. The above photograph shows a part of the line, which is approximately 600 feet in length. At the left is the coating bath and the cooling tower (*Photo by Aetna-Standard*)

Right: A 55-pound zinc pig is added to the molten galvanizing bath in the coating unit at Jones & Laughlin Steel Corporation's new Continuous Galvanizing Department by Fred J. Pettit, Operator. The sheet emerges from the bath through coating rolls and proceeds on a 50-foot high cooling tower permitting a uniform drying of the galvanized coating (*Photo by Aetna-Standard*)

INDUSTRY NEWS

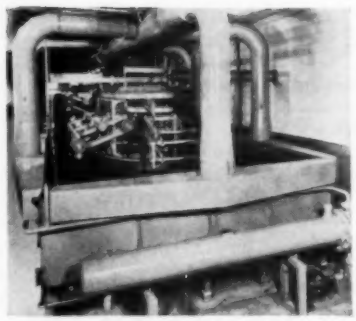
Zinc, Plus Choice of Chromate Finishes—Two men do the work of 10 or 12 in processing 8,000 lbs. of zinc plated and chromated nuts and bolts an hour with a new 24-barrel automatic horizontal plating machine. It's at Bellevue Plating, Detroit, Mich., a wholly owned subsidiary of the National Machine Products Company of Utica, Michigan.

Taking up an area of only 65 x 14 ft, the line was built by Udylite Corporation, Detroit. It includes a choice of two Iridite* chromate finishes following the zinc plating. First production came off the line in February, 1955. Bellevue officials already are thinking about a similar line for cadmium plating.

The new line provides top flexibility. For example, the machine operator can set a mechanism at the loading station which determines the processing of each load in the postplating cycle. It can be made to go into either the clear or the iridescent yellow Iridite. Barrel cylinders revolve at slower speeds at the Iridite station to provide maximum effectiveness of this treatment. Through action of a delayed set-down, the barrel can be retained in either chromating tank for a predetermined time cycle for Iridite treatment, at the election of the operator.

Although the machine is built for maximum flexibility around the Iridite tanks, similar controls provide the same versatility at the other stations.

Easy handling is another feature. Nuts and bolts arrive and leave Bellevue in the same containers. Samples are taken, and weight tags are attached to each. A record



Bellevue Plating's new barrel automatic zinc plating and chromate finishing machine

is kept of weight per piece, piece per pound and square inch area, all of which is translated into load per barrel for the machine. The cycle is set automatically.

After a power skip hoist dumps the container into a weighing hopper, a predetermined measure of parts is discharged into a pan which loads the 14 x 30 in Tempron barrels. They pass through an anodic alkaline cleaning cycle, then an acid pickle.

Zinc plating is next. Preparation stages are followed by an electrified cyanide dip, then the zinc plating. Cycle flexibility can be set to produce a deposit range of .00015 to .0005 in thickness.

The zinc plating solution is operated at 95 to 99 per cent efficiency, with intermittent filtration. The plating bath has a tendency converse to the typical zinc cyanide, in that frequent additions of zinc oxide are required to maintain the proper metal in solution. Current is 11½ amperes per square foot of area at 15 volts, with each plating cylinder drawing 875 amperes.

Any cylinder at any station is capable of raising or lowering independently of the others. This is done by a delayed setdown or skip mechanism.

Such flexibility makes the automatic machine ideal for either of the two Iridite chromate treatments used as final finishes for both appearance and protection against corrosion. Either one can be automatically applied by pre-setting the machine to the desired cycle.

Where a clear bright appearance and moderate corrosion protection is called for, Iridite No. 12 is used at a 1 to 50 dilution with water to produce a bluish bright surface on the plated parts in a few seconds. Since no bleach is necessary, parts are merely rinsed prior to automatic tumble drying.

Where a colored film is permissible and a higher degree of corrosion protection is required, Iridite No. 8-2 is used. This treatment is also operated at a 1 to 50 dilution with water and a few seconds immersion will generate a yellow iridescent coating. This protective coating will meet U. S. Government Specifications calling for an excess of 100 hours Salt Spray test

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Please give me details on how I can get a test supply of "Plus-4" anodes sufficient to fill one tank.

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"PLUS-4" ANODES

(Phosphorized Copper)

You have everything to gain and nothing to lose by setting up one acid-copper-plating tank to test "Plus-4" Anodes.

Reports from electroplaters who have made the test tell the same story. Copper thrown away as "solution dumped" goes way down. The cost of "acid added" goes way down. There's no copper wasted in the bottom of the tank as sludge. And small "fish" cut down scrap loss.

The smooth, heavy cathode deposits—without diaphragms or "bagging"—mean better work. What's more, "Plus-4" Anodes cost no more than ordinary anodes. Send the coupon in today. 56139

WHY PLATING WITH "PLUS-4" ANODES COSTS LESS

+1 no anode sludge (no "bagging" or diaphragms required)

+2 no copper "build-up" in solution

+3 smooth, heavy cathode deposits

+4 up to 15% more cathode deposit per anode

"PLUS-4" ANODES a product of ANACONDA®

Made by THE AMERICAN BRASS COMPANY For use under Patent No. 2,689,216

on .0002 of zinc without breakdown to white corrosion products.

Both Iridite treatments have proven their flexibility and economy in operation, allowing the plating of a minimum amount of zinc with greatly increased protection against corrosion. The Iridite solutions are maintained as are all other operating solutions by laboratory control in order that they result in a maximum of appearance, protective value, and economy.

Operations at Bellevue were set up primarily to handle the plating requirements of the mother company, but open capacity is available for job-shop contracts.

The Ford Motor Company has given The Udylite Corporation, of Detroit, an order for one of the largest plating installations in the world.

The contract calls for a complete installation of two Udylite Straight Line Full Automatics to handle the plating of bumpers for Ford products. The equipment is to be installed at The Monroe, Michigan Plant of Ford's Parts and Equipment Manufacturing Division. The first machine is to be installed and ready for operation early next year and the second about six months later.

The Udylite machines will be over 750 feet long—the largest rack type plating machines ever built.

The installation will include 80 motor generator sets totalling more than 800,000 amperes. The ventilation system will have a capacity of over 700,000 cfm.

This contract is one of the largest ever placed in the Plating Industry.

The Udylite Corp. has organized a special division, within the company, to carry out this installation. By this device Udylite can continue their service to all other customers without interference or holdup.

Shown above is **Henry Felix O'Reilly** receiving service token watch from **William E. Belke,** president, at banquet in honor of retiring personnel of the Belke Manufacturing Co.

Henry is well known to many in the plating industry through years of activity in the Belke sales department. He took care of correspondence phone service.

New Building—Paul-Munroe Company, Los Angeles representative for Rivett Air and Hydraulic Valves and Cylinders, will headquarter at its own, new 3000 sq ft building at 6430 East Gage Avenue, Bell, California.

Paul-Munroe has added R. A. Norberg to its staff as a new sales engineer. Norberg was formerly with the Republic Supply Co. and is a graduate of Stanford University.

Laboratories for Customers—Two separate laboratories are maintained by McAleer Manufacturing Corporation, Detroit, Mich. makers of polishing and buffing compounds.

Lab for Customers

One is devoted to product development in buffing compounds to meet special needs of customers.

The second laboratory is concerned with quality control. Its experienced personnel analyze raw materials and finished products.

PARTS by the thousands

cleaned and deburred automatically

in this **RANSOHOFF**

automatic media return tumbling barrel

widely adaptable for

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Media is retained in drum, eliminating costly hand separation and loss of media.

Mass cleaning and finishing of stamped, forged or cast parts in this RANSOHOFF Automatic Tumbling Barrel cuts hours of time and dollars of cost.

The Automatic Media Return Tumbling Barrel performs all operations, including cleaning, deburring, descaling and media separating all within the drum, without manual handling.

Expertly engineered, compactly designed and ruggedly built, a RANSOHOFF Automatic Media Return Tumbling Barrel may allow mass cleaning and finishing of your parts with tremendous savings in time, labor and cost.

Send samples of your parts for a free evaluation.

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Ransohoff

An old name...the newest ideas

INDUSTRY NEWS

Power Conversions Units—An extended line of selenium ac to dc power conversion units has been announced by General Electric's Rectifier Department at Lynn, Mass., with single-unit ratings to 125 kw now available.

Up to this time, the company has offered single-unit ratings beginning at 0.75 kw and extending to 25 kw. General Electric engineers say the advantages of larger blocks of power in single units include cost savings of at least 10 per cent and up to a 100 per cent saving in floor space. A single 125 kw unit, for example, requires only 12.5 square feet of floor space, compared with 26.8 square feet for five 25 kw units providing the same amount of power.

Research Office in Europe—The General Electric Research Laboratory's new European office now has a permanent address at Pelikanstrasse 37, Zurich 1, Switzerland. Creation of the overseas office was announced by the Research Laboratory last December when Dr. George J. Szasz was named as GE's first scientific representative abroad.

Mueller Electric Expands—Scott Mueller, of Mueller Electric Company, Cleveland, O., announces the breaking of ground for an additional 6,000 sq ft of production floor space.

Scott says, "Expansion has been triggered by heavy demands upon our production facilities.

"Mueller has always been the first to supply the best possible electric clip for each potential use even before that potential became a widespread need. That has again been the story with our newly developed miniaturized clips. Their fine reception throughout the industry has had a lot to do with our expansion.

"A new slant to the story, however, is consistent employment of trade journal advertising and the rigorous pursuit of better point-of-sale merchandising methods."

Mueller

International Water—Dr. Foster Dee Snell, president of Foster D. Snell, Inc., firm of chemists and chemical engineers, has been appointed as the representative of the United States on the Water, Sewage, and Sanitary Wastes Division of the Applied Chemistry Section of the International Union of Pure and Applied Chemistry. Other nations represented are Holland, Belgium, Great Britain, France, Switzerland, and Germany. The Division was reorganized at the Zurich meeting of the Union in 1953 and held its first official meeting in London on December 15 and 16, 1955. The broad subject of international study is "The economic use of water and the solution of effluent problems in industry." Initially specific fields to be given special attention are steel, beet sugar, pulp and paper, heavy chemicals, coal mining, and electroplating.

The initial reports of the new division will be edited by Mons. R. Colas of France and available for discussion at the meeting of the International Union in Paris during the summer of 1957. They will be bilingual, either in French or English with an abstract in the other language. After approval by the division, the reports will be published.

Demonstration—The Markane Development Company of New York has announced that there will be a demonstration of their new selective plating method, the Dalic Process, in Washington, D. C. during the AES Convention, June 17–21. AES members interested in witnessing Dalic in action are invited to a demonstration in the Virginia Room of the Mayflower Hotel.

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Formax produces a complete line of buffing compounds in bar, tube and liquid form.

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ZIPPO SISAL BUFFS

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

Descriptive Catalogs Sent on Request

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"THE FOUR McALEERS"

INDUSTRY NEWS BRIEFS

● The **United States Information Agency** reports automation is high on the list of the most-asked-for subjects in its overseas libraries. To cope with the interest generated in this typically American technological development the USIA has stepped up its supply of articles, books, pamphlets and motion pictures on the subject.

● Dr. Henry H. Hausner, an expert in powder metallurgy and in the construction of atomic power plants will receive the **Stevens Institute of Technology** Powder Metallurgy Achievement Award for 1956.

● For the second year in a row, employees of **Ansul Chemical Company,** Marinette, Wis., have chalked up a perfect safety record, thereby earning an extra day's pay.

● **American Potash & Chemical Corp.** has announced substantial price reductions in quantity lots of elemental boron, ranging up to a 35 per cent price decrease in quantities of 100 pounds or more.

● **Bumpers, Inc.,** manufacturers of reversible dock and truck bumpers, has been purchased by **Rowe Methods, Inc.,** Cleveland, manufacturers of hydraulic dock leveling devices. Bumpers will henceforth operate as a wholly owned subsidiary of Rowe.

● **Arwood Precision Casting Company,** Brooklyn, N. Y., has joined the **Investment Casting Institute,** Chicago.

● **Rockwell Manufacturing Company** has acquired the assets of **Locomotive Finished Materials Company** of Atchison, Kansas.

● The Department of the Army has announced award of a contract to the **Nuclear Development Corporation of America** (NDA), White Plains, N. Y., for the purpose of determining the technical feasibility of applying nuclear power to Transportation Corps equipment used in land and water operations.

● **Kaiser Chemicals Division** of **Kaiser Aluminum & Chemical Corporation** will undertake a $3-million expansion program which will substantially increase its capacity to produce its refractory and magnesia products.

● Most of Britain's biggest electrical firms will be exhibiting at the **British Industries Fair** in April. This year for the first time the electrical section appears in London, instead of at the Birmingham B.I.F.—from April 23 to May 4 at Olympia Hall.

● Although the steel industry cannot be expected to continue indefinitely its production at the annual rate of about 126 million tons which prevailed during January, there is little reason to believe that output in 1956 will decline sharply from the 117 million tons produced in 1955, according to an analysis of the nation's steel industry as prepared by the economic staff of **National Securities & Research Corp.**

● **Atlas Powder Company,** manufacturer of explosives, chemicals, and activated carbons, will award eight $1,000 college scholarships again this year.

Barrel Nickel Plating Calculations

●

Calculations in barrel nickel plating are useful for several reasons. Costs must be figured, specifications adhered to and normal additions made.

●

Generally both anode and cathode efficiency in barrel nickel plating are for all practical purposes 100%. Anode consumption may be estimated closely by using a figure of one pound of nickel for each 100 amperehours. A like amount is deposited on the work. Only when the cathode contacts are out of the work mass do they pick up any significant amounts of nickel. The average thickness of nickel plate on the parts may be easily calculated by knowing the surface area, number of amperes drawn and time. The distribution of nickel in barrel plating is normal and with the special solutions recommended even slightly better than Watts nickel. Thus recesses, threads and similar parts will have much less plate than points and other high current density portions.

●

Dragout losses will of course vary considerably. As a rough estimate, in a regular 40 hour week about 10% of the solution will dragout.

●

Other cost calculations, such as power cost, depreciation, labor and overhead factors are part of standard cost accounting practice.

●

Brighteners can be an important part of the costs. Generally, it is better to express such costs in terms of pounds of nickel plated rather than in terms of pounds of work plated. It would be simple to have a low cost in terms of work if plating were done for one half hour at 6 volts since the number of pounds of nickel used would be low. These parts would only have a very thin coat of nickel which would quickly wear off and be unsatisfactory for many purposes.

●

Brightener costs will vary considerably in terms of pounds of nickel plated just as they do in still tank plating. Those plates requiring high brightener to give good brightness from thin plates will require more brightener per pound of nickel than heavy plate. The amount of brightener to secure acceptable brightness is less when the surface is bright to start with.

●

Calculations on barrel nickel plating are simple but are important. The information above gives most of the factors involved. If you have a special question write us and we'll try to answer.

TRUE BRITE CHEMICAL PRODUCTS CO.
92 FALLS AVE. OAKVILLE, CONN.

INDUSTRY NEWS

PVC Piping in Chromium Plating Operations—As the result of an extended study of the corrosion problems entailed by chromium plating operations, the Perfect Circle Corporation has installed unplasticized polyvinyl chloride (PVC) piping systems. They form a part of the new $50,000 chromic acid recovery and solution purification facilities at the company's plant in Hagerstown, Ind.

There are five applications of PVC piping in Perfect Circle's chromic acid recovery and purification steps.

In the first application, 1-¼ in and 1-½ in lines are employed on the deionizer. Deionized water, instead of distilled water is used, since it most economically meets Perfect Circle's needs. The elimination of ions (electrified particles of matter of subatomic dimensions) from the process water prevents plating imperfections.

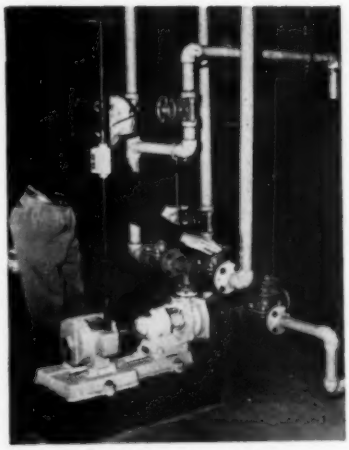
In the second application, 2 in lines serve a 1500 gallon dilution tank where chromic acid is handled in concentrations of 10–40 per cent.

In the third application, lines ranging from 1 in through 2 in serve a 1500 gallon adapter tank where water containing a 1 per cent concentration of chromic acid is processed.

In the fourth application, 2 in lines connect to a 350 gallon sulfuric acid regenerant sump tank.

In the fifth application, a 2-½ in line is employed for drainage of regeneration wastes.

The PVC operating pressures at Perfect Circle are 25–75 psi. Temperatures go from 50° to 90° F.



Plastic Piping at Perfect Circle

Dallas Lunsford, the company's chief metallurgist, was the project engineer. The installations were made by C. L. Gough, plating engineer and his staff.

Gough listed these advantages provided by Perfect Circle's PVC piping.

1. Scale, commonly found in metal and alloy lines, is not present and thus the acid and make-up water are protected against discoloration and contamination.

2. Hazards to personnel and equipment, caused by leakage due to corrosion, have been avoided.

3. The piping shows no signs of deterioration and is expected to be long lived. Had metal been employed portions of the piping systems would have had to be replaced at relatively short intervals.

4. PVC piping requires no paint, and its external surface is as resistant to corrosion as its internal surface. This is particularly important, since a portion of Perfect Circle's piping is outdoors.

5. PVC piping was easy to install, and can be quickly disassembled.

6. PVC has excellent electrical and insulating properties, and is non-aging.

7. The cost of PVC piping is much less than piping of the metals and alloys often used in chrome plating services.

These 2 in lines of polyvinyl chloride serve the chromic acid dilution tank at Perfect Circle. They are fabricated with injection molded fittings made by Tube Turns Plastics, Inc., Louisville, Ky.

Non-Corrosive Soldering Flux for Cu and Cu Alloys—Hi-Grade No. 29 soldering flux will decompose completely during the soldering of copper and copper alloys leaving the parts completely free of any flux residues that would cause corrosion or interfere with subsequent surface finishing operations. The use of Hi-Grade No. 29 soldering flux eliminates the need of expensive washing and buffing operations after soldering to remove flux residues.

A typical application of this flux is in the soldering of brass plumbing goods and copper tubing.

ARE YOU FIGHTING
CORROSION
ON YOUR
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The best weapons you can use in the fight against corrosion are the PROMAT processes for **zinc, cadmium, alloy** and **copper** plating. The throwing power, operating ranges, tolerance for impurities, low operating costs and utmost brightness and adequate metal deposition of PROMAT'S addition agents have been developed through years of research and extensive use in the field. PROMAT'S comprehensive line is used by leading platers throughout the world.

Let PROMAT'S service engineers help you solve your plating problems or, if you prefer, write to PROMAT for free technical bulletins on any of your specific plating needs.

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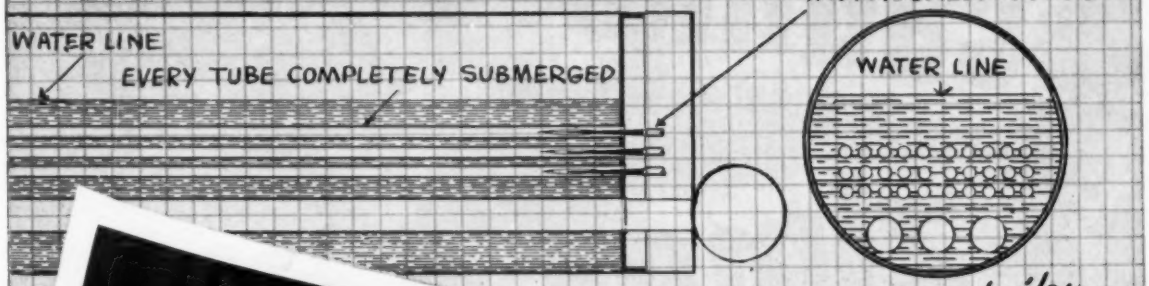
PROMAT MEANS PROTECTIVE MATERIALS!

when you buy a steam boiler . . . be sure to look at the picture of a Sellers Immersion Boiler



There's no other boiler like a Sellers—

every square foot of heating surface is water backed— —100% effective!

The long, individually gas fired tubes in the Sellers Immersion Boiler are all completely submerged nearer the water level—and over the return tubes! Heat is therefore uniformly distributed through them—and directly into the water—no where else!

there's no scale problem!

In immersion heating, the needed long tubes expand and contract sufficiently on intermittent firing to crack loose any hard scale that forms on the tubes. This practically eliminates the scale problem, makes maintenance simpler and increases the boiler's efficiency.

the average flue gas travel is 15 feet!

Maximum, almost complete utilization of the exhaust heat is assured with a Sellers Immersion Boiler. This is a result of Sellers exclusive design—with the firing tubes completely submerged and *located over the return tubes*, there is a long, slow flue gas travel—an average of 15 feet! Heat can only go into the water.

There's no other steam boiler like a Sellers Immersion Steam Boiler. Its simple design gives you a package boiler unit with many other outstanding features. Minimum maintenance and maximum efficiency combine to give you years of remarkably low operating costs. Twelve sizes available!

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Your letterhead will bring you this tell all, dollar saving story on all 12 sizes.

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New efficiency in plating brighteners

Cadmium and zinc plating need not be dull and frosty. With Cadmax and Zimax, new brighteners distributed exclusively by Federated, cadmium and zinc plated parts are glossy and smooth.

These new Federated brighteners provide maximum throwing power, maximum coverage, maximum allowable current density, maximum brilliance and maximum luster. Zimax brighteners are available in both liquid and powder forms; Cadmax is available in liquid form only.

Ask your nearest Federated distributor to show you what Cadmax and Zimax will do. Or fill in the coupon below and we'll have a Federated sales engineer call on you from the nearest of our 13 plants and 23 sales offices.

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I want to know more about Cadmax and Zimax, your new cadmium and zinc plating brighteners. Please have a salesman call on me.

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Company.....

Street.....

City.....Zone.....State.....

INDUSTRY NEWS

Patent—The U. S. Patent Office has granted a patent to S. N. Hunter, board chairman of Chemical Sealers, Inc., for multiple paste pigments, metallic and non-metallic, having a number of advantages over previously existing paste pigments.

Chemical Sealers, Inc., Belleville, Ill., has the exclusive license to manufacture the new paste pigments. CPC is the registered tradename for paste pigments manufactured and sold exclusively by Chemical Sealers, Inc., under the Hunter patent.

CPC pigments are non-hygroscopic, non-oxidizing, non-corrosive, non-hydrolizing in the presence of water, acids or alkalies and non-discoloring. CPC pigments are non-volatile (Cleveland open cup flash point: None).

Paints, varnish, enamels and inks manufactured with CPC pigments produce finished products which possess greater durability, luster and permanence. The wetting agent incorporated in CPC pigments is a halogenated, mobile, oily-like viscous liquid which remains permanently plastic.

CPC pigments are the first paste pigments of such metals as copper, bronze and even elemental iron, with practical applications. Paste pigments of copper and bronze, until the Hunter invention, had been entirely impractical because of discolorization and oxidization. The new metallic pigments remain undiscolored and unoxidized indefinitely, even when exposed to moisture and to corrosive atmosphere with concentrations of acids and alkalies.

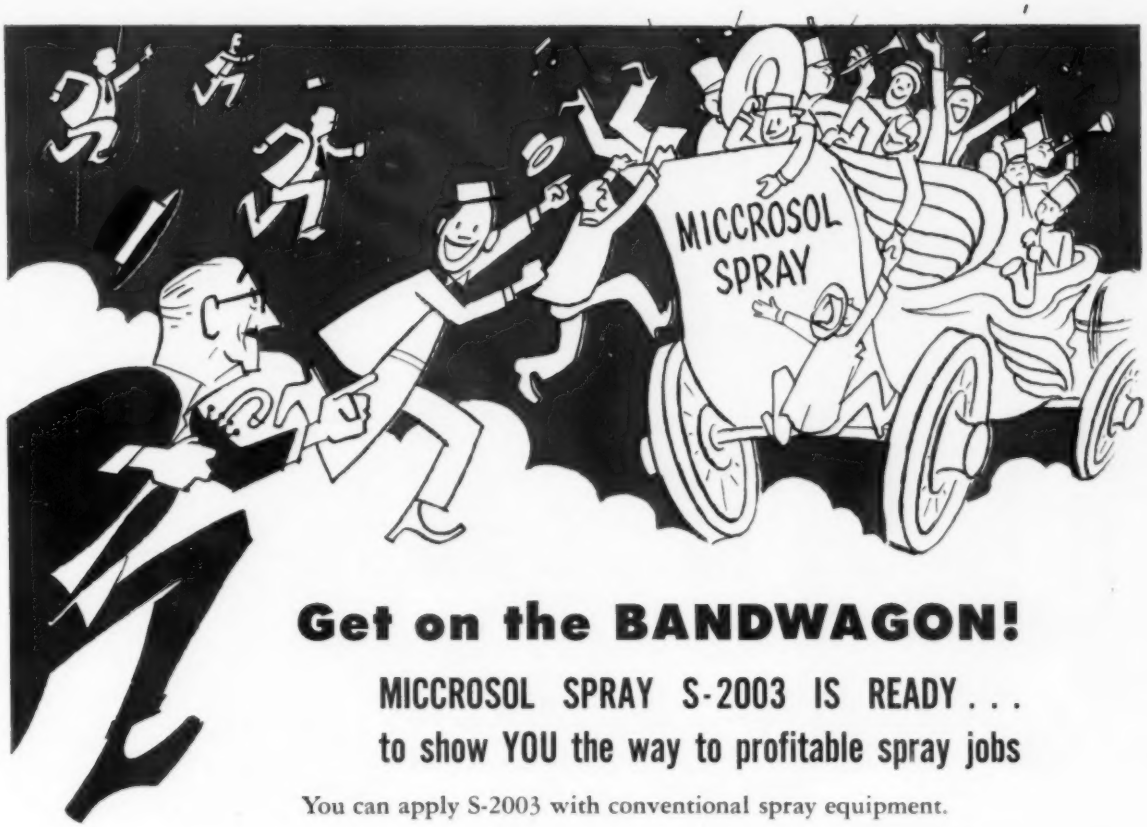
Among the other metallic pigments which now are being developed by Chemical Sealers, Inc., and which may be used effectively, are aluminum, either polished or unpolished: silver, gold, lead, antimony, nickel, titanium, stainless steel, beryllium, tin, chromium, vanadium and tungsten. A number of other metallic pigments may be used as well as mixtures of such pigments.

The Hunter invention is protected by both U. S. and Canadian patents.

Named as Distributor—Appointment of Conversion Chemical Corporation as its distributor has been announced by Chandeysson Electric Company of St. Louis. Conversion Chemical will handle the complete Chandeysson line of low-voltage motor generators for all types of plating, tinning and electrolytic work.

James F. Carland, Chandeysson executive vice-president, stated the appointment would enable Chandeysson to render even better service to its equipment users. "Kenneth P. Bellinger," Carland said, "is president of the distributorship and is well known throughout New England as a man well qualified on plating equipment and motor generator set power supply."

Conversion Chemical Corporation has offices at 98 East Main Street, Rockville, Connecticut.



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You can apply S-2003 with conventional spray equipment.

You can apply 60 mils thickness in one application without sagging of material. If multiple coats are required, a short cure time is all that's needed between applications. A contrasting color can serve for layer identification, if desired.

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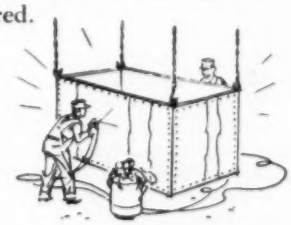

You can use S-2003 in all plating baths. It has the same toughness—chemical, corrosion, and abrasion resistance as Miccrosol E-1003. Our adhesive systems provide outstanding adhesion to metal surfaces.

Solvent additives are not necessary. S-2003 is 100% solids and is sprayed as received. Time consuming and expensive adjustments are unnecessary. Problems of material instability and film cracking are eliminated. There is no solvent loss and less operator fatigue with Miccrosol Spray S-2003.

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INDUSTRY NEWS

Griffin

Bart Laboratories—Bart Manufacturing Corporation and Bart Laboratories Co., Inc., both of Belleville, New Jersey, have been consolidated to form one corporation, according to an announcement from S. G. Bart, president.

A pioneer in industrial precious metals plating and electroforming since 1912, Bart Laboratories will retain its identity as a separate division of Bart Manufacturing. Ray N. Griffin, vice-president, has been appointed general manager of the division, which will now share some of the research and development facilities of the parent organization.

Griffin states that in conjunction with the recent expansion of the precious metals plating facilities of his division, the current consolidation will enable his technical staff to do more developmental work in precious metals applications for the electronic and electrical industries.

Gold Colored Al_2—A new method of producing non-fading gold-colored aluminum in a variety of shades and tones has been developed by Kaiser Aluminum & Chemical Corporation.

Source of the color is built in to the metal itself. The color is brought out—without the use of dyes or other coloring materials—by anodizing under readily controlled conditions. The gold color may be varied from pale straw to deeper gold and gold-bronze tones, and the finish may be either bright or satin.

The new process, protected by patent rights of the corporation, imparts a sunfast gold color and provides excellent color matching by eliminating the uncertainties that unavoidably occur with dyes or other coloring agents which previously had to be added to the anodic coating. By eliminating the dyeing step, the finishing process is simplified, thus resulting in substantial time saving.

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1—6000/3000 AMPERE, 6/12 VOLT, **CHANDEYSSON**, Synchronous, Exciter-in-head.
1—5000/2500 AMPERE, 6/12 VOLT, **CHANDEYSSON**, Synchronous, Exciter-in-head.
1—4000/2000 AMPERE, 6/12 VOLT, **CHANDEYSSON**, 25° C., Exciter-in-head.
1—3000/1500 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Exciter-in-head.
1—3000/1500 AMPERE, 6/12 VOLT, **COLUMBIA**, Synchronous.
1—2500/1250 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS**, Synchronous, Exciter-in-head, 25° C.
1—2000/1000 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS**.
1—1500/750 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING**, Synchronous, Exciter-in-head.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Synchronous, Exciter-in-head.
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1—750 AMPERE, 60 VOLT, **HANSON-VAN WINKLE-MUNNING**, Synchronous, Exciter-in-head.
1—500 AMPERE, 25 VOLT, **CHANDEYSSON**, Synchronous, Exciter-in-head.

RECTIFIERS

1—2000/1000 AMPERE, 6/12 VOLT, **G. E.**, brand new selenium stacks, with "On-load" Automatic Voltage Regulator.
1—**GREEN SELECTOPLATER**, 1800 AMPERE, 12 VOLT, 220/3/60.
1—BRAND NEW 2000/1000 AMPERE, 6/12 VOLT, **G. E.** COPPER OXIDE RECTIFIERS, with Controls.
1—1500/750 AMPERE 6/12 VOLT, UDYLITE-MALLORY
4—1440/720 AMPERE, 6/12 VOLT UDYLITE-MALLORY

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1—TOLLHURST CENTRIFUGAL DRYER, 20" dia. basket, with Steam Heat
1—H-VW-M Full-Automatic Plating Machine, 87' long, 39" lift, was used for copper and nickel.
1—H-VW-M Full-Automatic Plating Machine, 87' long, 39" lift, was used for chrome.
1—H-VW-M Full-Automatic Cleaning Machine, 40' long, 39" lift.
1—Production Pipe Polishing Machine, Model 101, Motorized.
2—**RONCI** Enamelers, No. R-100, and No. R-200.
2—**U. S.** ELEC. TOOL, Mod. 110, TWIN 15HP POLISHING LATHES.
1—MODEL "A" PRESSURE BLAST.

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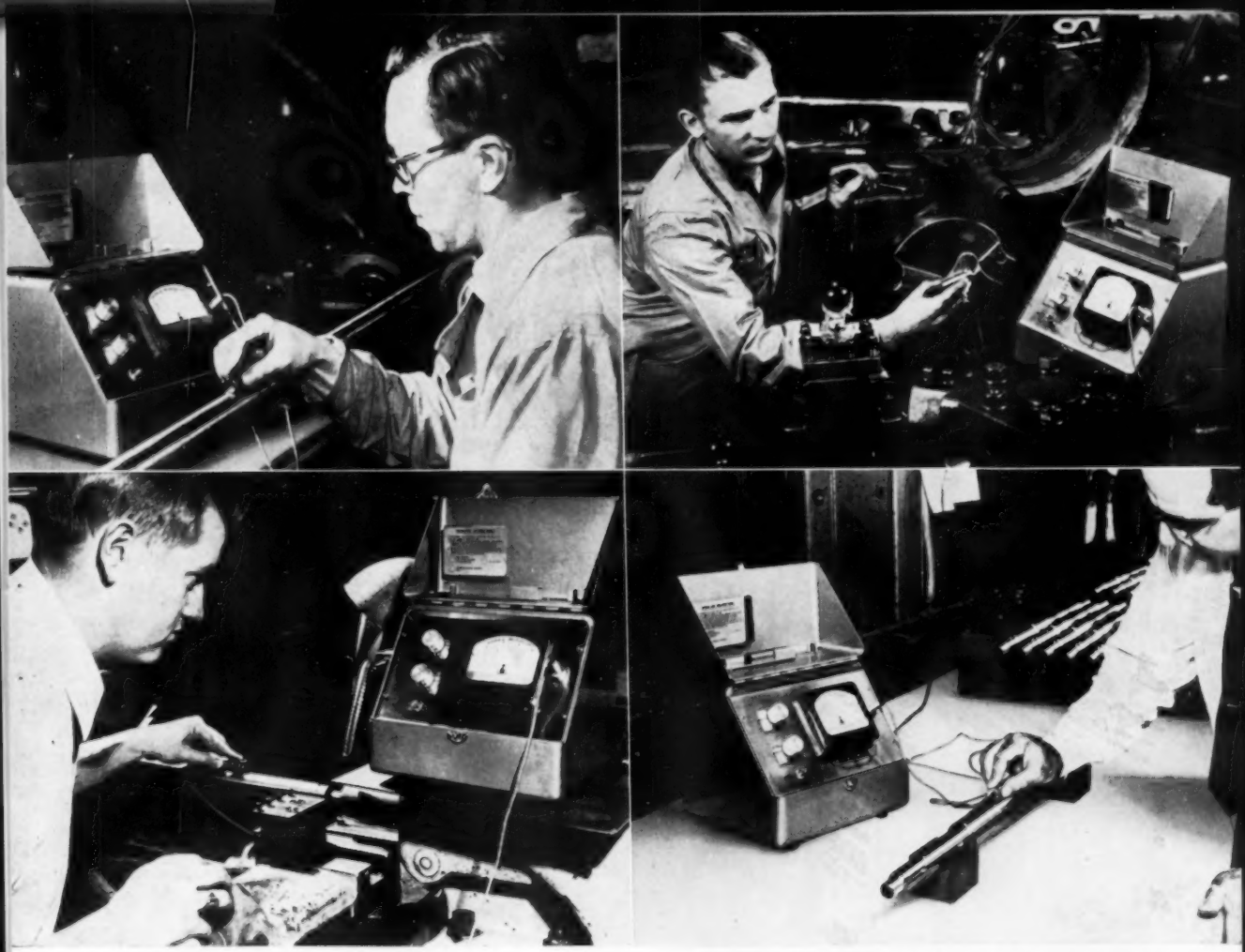

At left top: Ingersoll Rand Company uses the Brush Surfindicator to check Navy pump shafts. The Surfindicator is used whenever drawings indicate micro-finish on parts

Left bottom: The Surfindicator is used to check shaft finish, while the shaft remains in the machine, at Metcut Research Associates

At right top: At Sterling Engine Company, the Surfindicator is used to check machined finishes without removing the piece from the machine

At right bottom: This application (at Behr-Manning Division of the Norton Company) shows the versatility of the pick-up in checking the finish of cylindrical shapes

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Division Expands Facilities—Sel-Rex Products Division has established new offices in Detroit, according to an announcement from Morris M. Messing, president, Bart-Messing Corporation and Sel-Rex Precious Metals, Inc.

Sales coverage as well as dealer-distributor liaison for Sel-Rex products will be under the direction of S. S. Wilson, sales manager and will extend throughout the midwest, including Michigan, Minnesota, Indiana, Illinois, Ohio, Wisconsin and Iowa. The move to new quarters was necessitated by greatly increased demand for Sel-Rex products in the area, and entails the expansion of warehousing and service facilities.

Products and equipment to be handled through the Detroit office are selenium and germanium rectifiers, double-duty filters for liquid clarification and solids recovery, the compact portable Sel-Rex jet plater and the entire line of Sel-Rex precious metals plating salts and solutions.

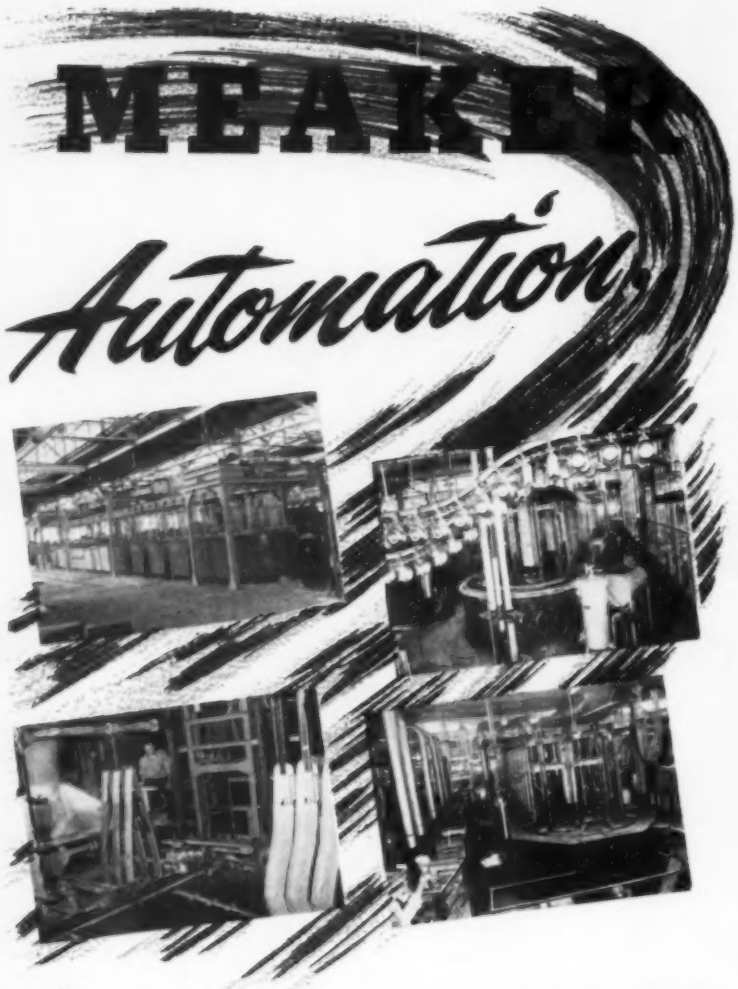
Three-Day Workshop Sessions—Sales representatives of the Manhattan Rubber Division and the Packing Division of Raybestos-Manhattan, Inc., Passaic, N. J., recently participated in three-day workshop sessions held at the Lake Shore Club, Chicago, Ill. Meetings of the western district of Manhattan Rubber Division were held from February 13 through 15. Raybestos-Manhattan Packing Division meetings were held February 15 through 17 with representatives from all districts attending.

R. B. Hazard, sales manager for both divisions, headed up the program and was aided by assistant sales manager, Packing Division, John McKinlay.

A. L. Hawk, western district manager, was host for the sales groups.

John F. D. Rohrbach, president of Raybestos-Manhattan, gave an address to the combined division groups at a luncheon on February 16. He highlighted the progress of the corporation and the divisions, and discussed plans for expanded sales for the coming year.

Merger—West End Chemical Company and Stauffer Chemical Company announce that representatives of their Boards of Directors are giving active consideration to a proposal for merger of the West End Chemical Company with Stauffer Chemical Company. Under the terms of the proposal it is contemplated that West End will continue to operate under its present management as an autonomous division of Stauffer Chemical Company.



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INDUSTRY NEWS

Finances—Within the next 12 months some 10,000 small manufacturers in the metal-working and electronics industries will require approximately $100 million to fulfill their contractural commitments.

This finding results from a national survey conducted by Coastal Commercial Corporation, New York City, leading firm in the commercial finance field.

The survey also revealed that loanable bank funds for the small manufacturer are continuing to tighten, now that the "bonanza" finish on the postwar business boom has begun to fade.

About a fourth of the firms responding to the questionnaire reported that they had been unable to secure the loans they were seeking.

With the decreasing availability of bank money, the best source of financial aid these days for the secondary or "marginal" producer is probably the commercial finance company.

This is especially true for the metal-working and electronics industries. Banks, even if blessed with a superfluity of "loose" money, would be reluctant to make loans for highly "technical" operations. To do so, they would virtually need a special staff to evaluate the project, and this in turn would boost overhead to where improbable rates of interest would have to be charged.

Surface Finish Inspection—Manufacturers are discovering that considerable waste can be cut from the finishing operations by checking surface finish right at the machine, instead of in the inspection department.

The portable instrument (the Surfindicator manufactured by Brush Electronics Co. a division of Clevite Corp., Cleveland, O.) weighs only fifteen pounds and can be moved to any part of the plant, quickly and conveniently. It is used to measure surface roughness of metal, plastics, glass and vitreous ware, ceramics, paper and other materials.

Because it is designed as a portable instrument that goes to the work, the Surfindicator has been built to high standards of ruggedness and strength. Even though it is moved from place to place frequently, it will retain its accuracy and sensitivity. The dial is calibrated in terms of the new ASA specifications, and the Surfindicator can be used on flat or curved surfaces, or to measure the internal finish of bores.

Plating Machine Set Up—Republic Steel Corp. has installed an electrolytic machine for copper plating stainless steel wire at its Union Drawn Steel division's Massillon, Ohio, plant. The machine is said to be the first of its type to come into use in the cold finishing industry.

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Will trade cathodes, butts, swords, clips, rods, etc., that will meet your regular supplier's specifications for recasting into anodes; or, we can supply cast or rolled anodes. . . . YOU WANT THESE.

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PERSONALS

Combs Teyral Branciaroli Smith Bride

Expansion of the technical service section of the Chromium Chemicals Division of Diamond Alkali Company is announced by **F. W. Jarvis,** general manager of the division.

E. L. Combs, supervisor of chromic acid sales for the past two years, will head the group, which is responsible for customer service and related laboratory work covering the application of Diamond chromium chemicals in the metal-finishing industry. He will continue to have his headquarters at the company's national offices in Cleveland.

Other members of the group are **Joseph P. Branciaroli,** technical service representative since November 1952, and **Robert C. Smith,** research chemist for the past four years. Both men will continue to be located at the Diamond Research Center in Painesville.

Also announced at the same time were the promotion of **Alexander E. Teyral** to the post of project engineer, the appointment of **J. Edwin Bride** to the division's technical sales staff, and the resignation of **Charles W. McConnell.**

Group leader in charge of development for Diamond's chromium Chemicals Division since November 1953, McConnell is leaving the company due to his wife's health. He and his wife are now moving to Florida.

Combs, who joined Diamond in 1950, is well-known in the metal-finishing industry. A member of the AES, Cleveland branch, he was general chairman of the AES National Convention and Fourth Industrial Finishing Exposition in Cleveland last year.

A past member of the Dayton branch, AES, and a charter member, past president and treasurer of the Columbus branch, Combs now represents the Society on the American Standards Association Sectional Committee B-73, Centrifugal Pumps for Chemical Industry Use. He is a graduate of Ohio State University.

Prior to joining Diamond in 1952, Branciaroli was associated for two years with the U.S. Bureau of Mines, working in pilot-plant operations in coal gasification. Previously, he had been located at the Wright Air Development Center, where he was concerned with metal-finishing research and development.

A member of AES, Cleveland branch, and Alpha Phi Delta, Branciaroli holds a BS degree in chemical engineering from West Virginia University. He is a veteran of both World War II and the Korean campaign.

Smith, who joined Diamond following graduation from Kent State University in 1952 with a BS degree in chemistry, is a member of the American Chemical Society and the Cleveland branch of the AES.

Teyral brings to his new assignment as project engineer 10 years' experience in development and technical service work in chromium chemicals. He was associated with the Development Department at the Diamond Research Center in Painesville from August, 1943 to October, 1953, and since then has concentrated on technical service of chromium chemicals and their applications in various industries.

Bride comes to Diamond with a broad background in plating and electropolishing fields. For the past eight years, he has been connected with the Electrochemical Research Division of Battelle Memorial Institute, where he was closely associated with research on trivalent chromium alloy plating baths. He is co-author of several patents on this work.

From June 1942 to October 1945, Bride was assistant to the supervisor of the Metallurgical Materials Review Division, Wright Aeronautical Corporation, Lockland Plant. A registered Professional Engineer in Ohio since 1946 and past-president of the AES, Columbus branch, he is a metallurgical graduate of Montana School of Mines, where he carried out work on benefication of low-grade chromite ores.

William H. Keener has been named special representative for the executive sales division of Reynolds Metals Company, with headquarters in the World Center Building, Washington, D. C. For the past four years, he has been associated with packaging sales at the aluminum firm's sales headquarters, 2500 South Third Street, Louisville.

Paul Bixler, a member of the headquarters sales staff since June 1955, has been promoted to manager of the International Division of F. J. Stokes Machine Company, Philadelphia, Pa.

Bixler, who was born in Sergipe, Brazil, was educated at Phillips Academy, Andover, Mass., and the University of Pennsylvania, where he majored in foreign trade and was graduated with a BS in economics. After several years as Latin-American representative for Armstrong Cork Company, prior to World War II, he joined the U. S. Navy, serving in the Office of Naval Intelligence and for a year and a half as assistant naval attache in Caracas, Venezuela. He held the rank of Lieutenant Commander at the time of his discharge.

Returning to Armstrong Cork Company for three years, he left that firm in 1949 to join the Eljer Company, Ford City, Pa., manufacturers of plumbing fixtures, as manager of its export department. He joined Stokes International Division in December 1954, as a member of its headquarters sales staff.

Gerard S. Clooney and **Andrew J. Lutz** are now representing Wyandotte Chemicals Industrial and Aircraft Sales Department. Clooney headquarters in the company's St. Louis office. Lutz in the Kansas City office.

Clooney Lutz

Clooney graduated from St. Louis University and has also studied at Washington University (St. Louis). He served 3 years in the U. S. Army and has had both retail and industrial sales experience.

Clooney and Lutz recently had intensive schooling in modern cleaning procedures at the Wyandotte Chemicals Industrial Research Laboratories. Both men have been given comprehensive training by experienced Wyandotte Chemicals Industrial field and technical service representatives.

Charles R. Pritchard of Bridgeport has been elected a vice-president of the General Electric Company.

Pritchard had been president and general manager of the General Electric Supply Company, a wholly owned distributing organization which was merged into the parent company as a division in January. He will continue to serve as general manager of the General Electric Supply Company Division.

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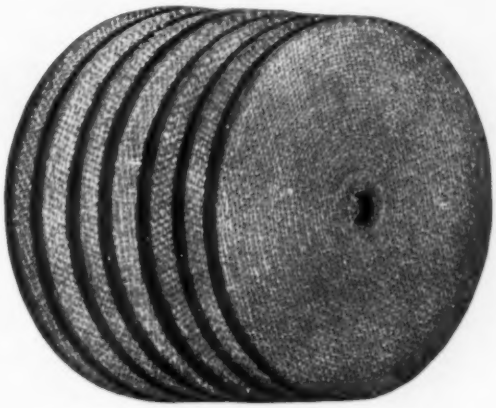

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PERSONALS

Lyons

Wolf

The appointment of **Gordon R. Lyons** as conveyor sales engineer for the H-VW-M midwest sales area has also been announced. **Richard H. Wolf** replaces Lyons as salesman in the Dayton area. Both appointments were effective March 1, 1956. Lyons has been with H-VW-M since June 1949, serving as salesman for the Dayton area until his current appointment.

Richard Wolf just completed a six-months' training course in the H-VW-M laboratory and other departments at the Matawan plant. During this period he also undertook graduate work in chemistry at Rutgers University.

Hugh V. McGuire has been appointed manager of equipment installation sales by H-VW-M. McGuire has been in charge of all sales engineering relating to engineering and installation activities, and his appointment is in line with H-VW-M's new policy for the consolidation and expansion of these activities. McGuire has been with H-VW-M for 15 years, during which period he spent time gaining extensive experience in the metal finishing equipment field. He has also specialized in metal finishing plant layout, the graphic arts field and export activities.

McGuire

McGreivey

Behr-Manning, division of Norton Company, Troy, N. Y., announces the appointment of **John C. McGreivey** as industrial sales manager for the New York division, serviced out of the Teterboro branch warehouse. He succeeds **A. F. Lehnhardt.**

McGreivey joined Behr-Manning in 1934 in advertisting. He soon moved to customer service, and became a salesman in 1939 assigned to the New England General Trades division. In 1941 he assumed full responsibility for a strong industrial territory in Connecticut. When Behr-Manning introduced its tape products in 1950, he stepped into tape sales.

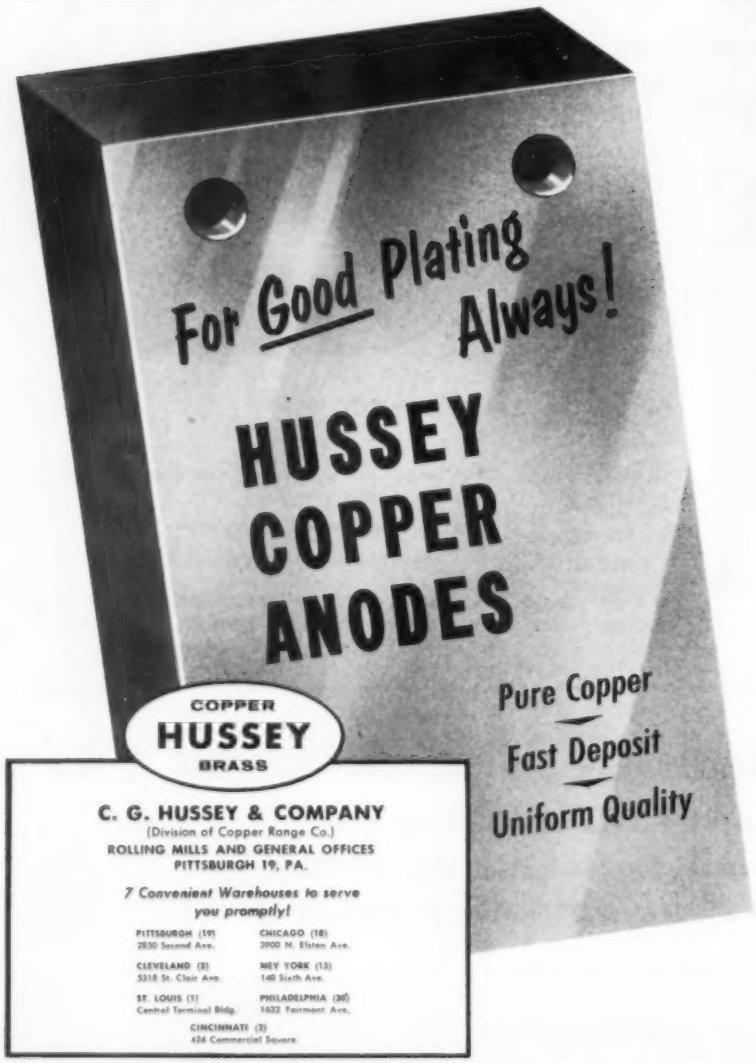
Atlas Powder Company has announced that **Dr. Sydney Steele,** formerly director of the planning staff, has been promoted to the position of industrial assistant to **Edward J. Goett,** vice-president in charge of the company's Chemicals Division. His new duties will include assisting in the division's diversification planning and other special assignments.

The company also announced the establishment of the Economic Evaluations Department in the Chemicals Division. The new department will conduct economic studies on all projects and expenditure programs for the division.

Robert J. Reilly has been appointed director of the new department. **James Weaver** and **Frank Lyndall, Jr.,** have also been assigned to it. At the same time it was announced that **L. Hastings Lyon** has been transferred to the newly created marketing research section in the Product Development Department. The section will conduct studies of present and potential markets for the Chemicals Division's products.

New assignments for three executive engineers in the Federated Metals Division of American Smelting and Refining Company have been announced.

B. E. Anderson assumes the position of chief engineer of Federated Metals Division with headquarters in Salt Lake City, Utah. **Arthur F. Kohn, Jr.** has become assistant to the general manager of Federated with headquarters at Perth Amboy, N. J. **Robert Dean Mathis** is named superintendent of the Los Angeles Plant of Federated Metals Division.



Sweeney

Stevens

The appointments of **William J. Sweeney** of North Hollywood and **Fredrick D. Stevens** of Whittier to fill key West Coast sales supervisory positions for Behr-Manning, division of Norton Company, Troy, N. Y., has been announced.

Effective immediately, Sweeney becomes regional sales manager of the Pacific region, and Stevens becomes industrial sales manager of the Los Angeles division. Sweeney succeeds **Paul S. Wiswell**, who retired March 31, and Stevens assumes Sweeney's former duties.

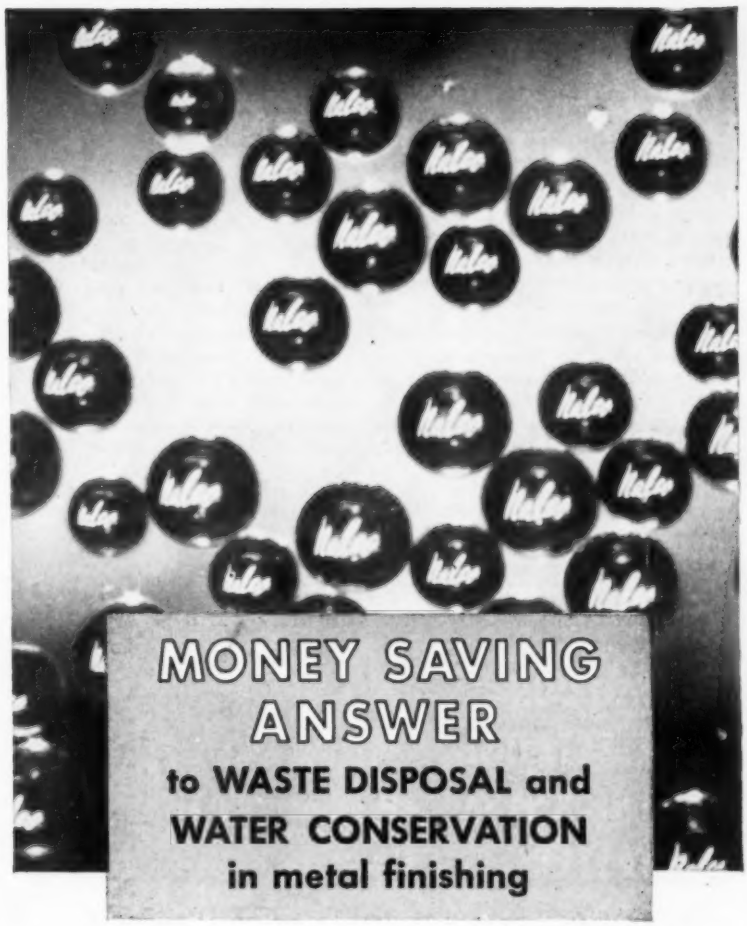
Tardiff

Burnham

Hanson-Van Winkle-Munning Co. has announced the appointment of **M. A. Tardiff** and **P. C. Burnham** to key sales posts in the company's midwest sales organization. Tardiff is now responsible for general equipment sales for H-VW-M's J. C. Miller Division, with headquarters in Grand Rapids. Burnham is appointed conveyor sales engineer for J. C. Miller Division territory, the states of Ohio, Kentucky, Tennessee, Mississippi, and, when needed, the Detroit area.

The Diversey Corporation, Chicago, announced the promotion of **Dr. Neil W. Berst** to director of Research Laboratories. In his new position, Dr. Berst will coordinate and guide new product development, improvement of current products and evaluation of competitive products.

Dr. Berst joined The Diversey Corporation in 1951 as group leader in charge of organic research. In 1954 he was selected to attend the Oak Ridge Institute of Nuclear Studies with 31 other leading scientists. His experience in the atomic energy field proved valuable in directing Diversey's expanding research programs utilizing radioactive isotopes.



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PERSONALS

The appointment of **Robert G. Page** as plant manager of the North Hollywood, Calif., plant of General Electric's distribution assemblies department has been announced.

Page joined the General Electric Company in 1948. Since then, he has held the position of supervising engineer, switches and circuit breakers for the company's Trumbull Components Department.

Page transferred to the company's distribution assemblies department as a manufacturing engineering specialist in January 1955, and in April of the same year was named plant manager of the department's plant at Maspeth, N. Y.

Ralph Goodwin, sales representative for the Pennsylvania Salt Manufacturing Company's Metal Processing Department in Peoria, Ill. and Indianapolis, Ind., has been assigned to serve additional accounts in Chicago.

Goodwin has been associated with Pennsalt Chemicals since 1951 specializing in sales of the Metal Processing Department's maintenance cleaners for railroads.

Joseph H. Duff has been appointed assistant technical manager of Graver Water Conditioning Co.

Duff, a graduate chemical engineer from Newark College of Engineering, has been with Graver's Technical Department for the past seven years. During that time he participated in the development of many of Graver's products in the industrial and municipal water treatment and industrial waste treatment fields. Duff, who has wide experience in both the practical and theoretical phases of these fields, is the co-author of several papers presented before leading technical societies.

Duff

Gygli, Jr.

Calvin E. A. Solla, Ohio district manager of H-VW-M Co., Matawan, N. J., announces expansion of H-VW-M coverage and service in Cleveland and central Ohio by the addition of **Robert P. Gygli, Jr.,** to the Cleveland sales staff. For the past four years he represented Pioneer Electric Supply Co. of Cleveland. He is currently going through a training course at H-VW-M's main plant in Matawan, preparatory to assuming his new duties in Cleveland.

Also announced is the appointment of **Arthur W. Sommerville** as sales representative for the company's St. Louis area. In this capacity Sommerville will be responsible for H-VW-M sales activities in the states of Kansas, Missouri, Arkansas, Oklahoma, Texas and Louisiana.

Sommerville

Leonelli

Bruno Leonelli has been elected vice-president of Wagner Brothers, Inc., Detroit.

Leonelli obtained his ChE degree at Wayne University, Detroit, in 1939. His experience in the metal finishing field includes 6 years with the Ternstedt Div., General Motors where he was chief chemist of the analytical laboratory; 7 years at Promat Div., Poor and Co. as division manager; and director of research and development at Wagner Brothers after joining that firm in 1954.

Leonelli will continue to head up product and process development activities at Wagner Brothers.

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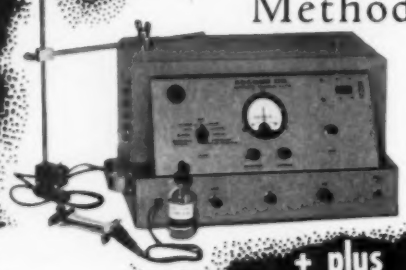
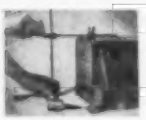
KOCOUR ELECTRONIC THICKNESS TESTER*

*Anodic Solution Method



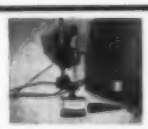
6 Simple steps . . . to quick, accurate results

1. MOUNT THE CELL . . . on the spot to be tested and clip lead wire to specimen.



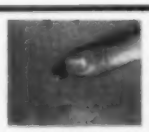
2. ADD TEST SOLUTION . . . which corresponds to the type of plating and base metal tested.

3. PLACE STIRRER IN POSITION.

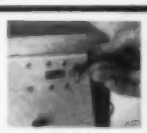


4. SET SELECTOR SWITCH to the type of plating to be tested as indicated on panel.

5. PRESS THE TEST BUTTON to start the test . . . and upon completion the unit shuts off automatically.



6. TAKE THE READING directly from the counter on panel i.e., 0.0005".



TOTAL TIME . . . less than 2 minutes

+ plus these features

- DETERMINE THICKNESS OF
  decorative chromium
  heavy chromium
  silver — copper
  tin — brass
  cadmium — nickel
  zinc — lead
  lead-tin alloy
  tin zinc alloy
  on various base metals and materials.
- WIDE THICKNESS RANGE
- DIRECT READINGS
- 90-95% ACCURACY
- TESTS ARE RAPID
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- ELIMINATES HUMAN ELEMENT

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PERSONALS

Four new staff assignments in the sales and research divisions of the Du Pont Electrochemicals Department have been announced.

Samuel C. Harris, director of sales, was appointed to the new position of general assistant to the management of the department.

Richard B. K'Burg, an assistant director of sales, was named director of sales, succeeding Harris.

Arthur I. Mandolis, assistant director of research in the department, becomes an assistant director of sales, replacing K'Burg.

Dr. H. K. Livingston, director of the Organic Chemicals Department laboratory at the Experimental Station, succeeds Mendolia as assistant director of research for the Electrochemicals Department.

All appointments were effective April 1.

James H. Bly has joined the Sales Division of High Voltage Engineering Corp., Cambridge, Mass. He will devote his efforts to sales and application engineering activities relating to use of the company's Van de Graaff supervoltage X-ray generators in industrial radiography.

Bly comes to High Voltage from X-Ray, Inc., Detroit, Mich., where he served successively as research director and division manager. He was formerly supervisor of radiography and electronics in the materials control laboratory at Pratt and Whitney Aircraft, East Hartford, Conn., after having attended the University of Chicago, where he majored in chemistry and physics.

A member of the ASM, ASTM and the Society for Nondestructive Testing, Bly is chairman of the ASTM Committee E-7 on Nondestructive Testing. He also served as national director of the Society for Nondestructive Testing and is presently representative of the ASTM Committee E-7 on the board of directors, Society for Nondestructive Testing. He is also active on committees of the Society of Automotive Engineers and the Investment Casting Institute.

Bly

Hopkins

William A. Hopkins, vice-president of Bart Manufacturing Corporation, Belleville, N. J., has been appointed general manager of the Bart Lectro-Clad Division.

Vice-president in charge of manufacturing since 1953, Hopkins will now also be responsible for all marketing and sales functions for the firm's Lectro-Clad, nickel plated steel pipe and fittings for anti-contamination and anti-corrosion applications. He will also maintain liaison between his company and Wickwire Spencer Steel Division of Colorado Fuel and Iron Corporation, who act as distributors for Bart Lectro-Clad, nickel plated steel sheet and plate.

An alumnus of the University of Cincinnati, where he majored in metallurgical engineering, Hopkins has held technical-executive and sales positions in the metal finishing industry since 1934. Employed as a plating engineer in various divisions of the Electric Autolite Company until 1945, Hopkins joined Continental Die Casting Corporation as plant manager. He has also been associated with Gerity-Michigan Corporation as technical director, and prior to joining the Bart organization in 1952, was Detroit area sales manager for the McGean Chemical Company.

During World War II, Hopkins was associated with the Kellex Corporation, in work on the Manhattan project.

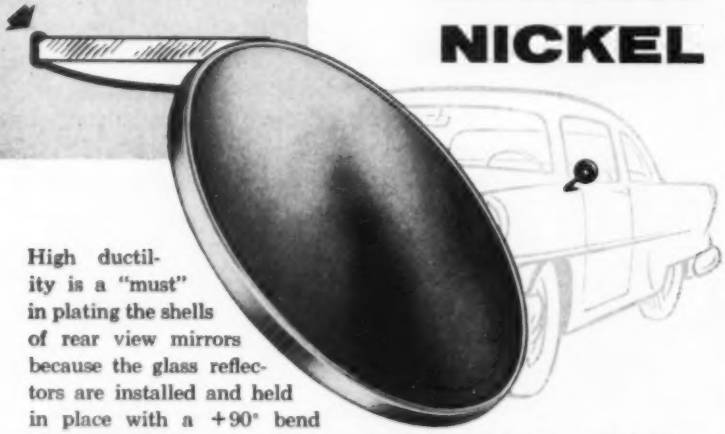
The election of **Robert A. Weaver, Jr.,** as a member of the board of directors of the American Metal Market Company, New York, publishers of the American Metal Market, a daily newspaper for the metal industry, has been announced.

Weaver is president and director of the Bettinger Corporation, Waltham,

for high ductility use...

SEYMOUR BRIGHT NICKEL

Here's where YANKEE METAL PRODUCTS CORPORATION relies on Seymour *high ductility* in plating its rear view mirror shells.



High ductility is a "must" in plating the shells of rear view mirrors because the glass reflectors are installed and held in place with a +90° bend *after plating.* It's one of the reasons why many producers of plated metal products rely on Seymour Bright Nickel Solutions. Seymour also assures them of greater throwing power, easy control and eliminates the need for buffing and polishing before chrome plating.

Let Seymour help solve your plating problems in its Experimental Plating Laboratory. Write for details.

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Mass., one of the country's leading manufacturers of porcelain enamel products. He is also chairman of the board of Graham Bell, Limited, of Streetsville, Ontario, Canada, and president and director of the Porcelain Enamel Products Corporation, Rehoboth, Mass., both members of the Bettinger international family of companies.

He is a member of the boards of directors of the Worcester Pressed Steel Company, Worcester, Mass.; the Penobscot Chemical and Fiber Company, Boston, Mass.; Joseph Breck and Son Corporation, Boston, and Techbuilt Himes, Inc., Cambridge, Mass. He is also vice-chairman of the National Board of Consultants of the Small Business Administration and executive committee member of the Associated Industries of Massachusetts. Weaver is a former national treasurer, director and executive committee member of the Young Presidents' Organization.

The Pennsylvania Salt Manufacturing Company has announced the appointments of **Wiley J. Pickett** and **Arnold E. Blitz** to its technical sales staff. Pickett will direct the introduction of Pennsalt's new Isotron products line to the aerosol propellants industry, while Blitz will introduce a companion line of refrigerants. Both products will be produced in a new plant at Calvert City, Ky., scheduled for completion late this year. This project is part of the company's recently announced $55 million expansion program.

Appointment of **Arlington R. Meek** to position of general traffic manager, Solvay Process Division, Allied Chemical & Dye Corporation, has been announced.

Meek succeeds **F. W. Brown** who retired January 31, after 30 years service.

Solvay's new traffic manager has been with the Company since 1927. During that period he has held such positions as plant traffic agent at Detroit, Mich., and Baton Rouge, La.; and assistant to the general traffic manager. In 1954, he was appointed assistant general traffic manager.

In his new assignment, Meek will be responsible for shipping and receiving activities of Solvay plants located in five States.

Meek will continue to make his headquarters at New York City.

Also announced were the appointments of **Hugh W. Causey,** manager of Solvay's Charlotte, N. C. sales branch since 1951, becomes an assistant director of sales. **Robert P. Baynard** succeeds Causey as branch manager.

Robert L. Reynolds becomes manager of the newly established Organic Chemicals Section; **George R. Barclay** is named assistant to manager of Special Alkalies Section; and **Ronald Lovatt** assumes the position of supervisor of Calcium Chloride Section.

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. . . has 95% efficiency
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Germanium has no peer for use as a semiconductor in providing an efficient source of DC current. However, germanium is extremely heat sensitive and must be protected against thermal overload and current faults which, if unchecked, would instantly destroy the germanium junctions.

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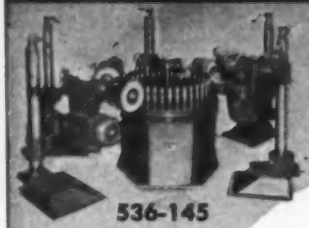
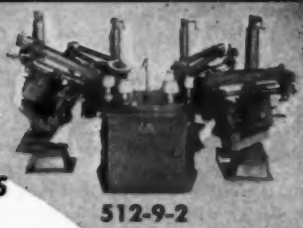


536-145



512-9-2

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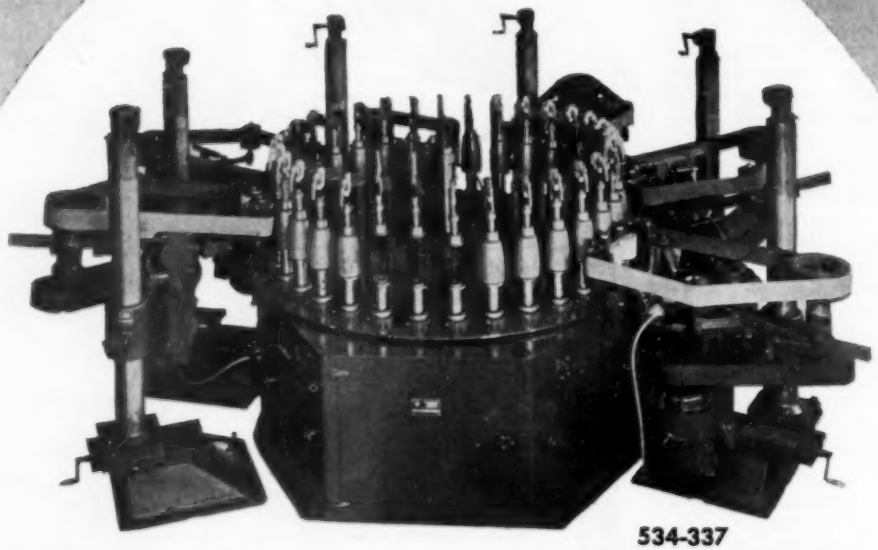

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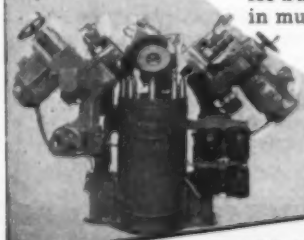

536-149

RECOMMENDATIONS and QUOTATIONS . . . will be offered on receipt of blue prints or preferably finished and unfinished parts you contemplate finishing, together with details of your present finishing operations and production requirements.

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REPORTS FROM ALL OVER . . . STRIPPED, CLEANED, DEGREASED

Our vigorous economy is still expanding. The best measure of the *whole* economy is the value of all goods and services produced: the Gross National Product. During the first quarter GNP rose to another all-time high: $402 billion annually! This is $40 billion over a year ago and $5 billion above 1955's best rate, set in its final quarter.

A ½-hp sander-polisher (Auto-Magic) by **Douglas Scott Dev Corp,** Cleveland, features an eccentric flywheel which gives an orbital polishing motion that each orbit overlaps the next. . . . Recent tests by **Int'l Nickel Co** show that stainless steel can be coupled with titanium with no increase in corrosion rate of either metal. . . . A new process by *K. Lauer,* U of Ala, using slaked lime in glycerine-water solutions to change sodium sulfate into caustic soda could put waste sodium sulfate recovery on a new economic footing. . . . In the technological program for survival (against the Soviets), *J. Killian Jr,* MIT, stressed the fact that secondary schools must pay greater attention to superior students, that the government's management of research and development must be simplified (with a close look at the weaknesses of current contractual methods and use of short-term budgets) and in removing road-blocks to private initiative. Almost 60 per cent of the top quarter in quality of our high school graduates fail to complete 4 years of college. He pointed out that the aircraft industry spends only 2.4 per cent of its research and development funds on basic research, compared with 7 per cent for the government, 4 per cent for all industry and 10.5 per cent for the chemical industry. . . . Ke-Tone for prevention or removal of hard water scale or build-up in valves, tanks, cooling towers, etc, is available from **United Chem Corp** of Hobbs, N. Mex. The scale is gradually disintegrated and put back into solution, and frequent blow-downs keep hardness at reasonable levels until the system is free of scale. . . . All wastes from **Socony's** Casper (Wyo) refinery now goes to open ponds in natural basins where most of the water evaporates, and the remaining waste seeps into the soil. None of it reaches the river. . . . A method of impregnating iron and steel sheets with titanium is said by *T. Sato* et al, Tohoku U, Japan, to yield a new material especially fit for use in making anode electrodes of thermionic and other vacuum tubes. The iron and steel sheets are subjected to the action of a mix of titanium chloride and hydrogen at 900–1100 C. . . . Niphos low-cost nickel alloy can be applied like paint to form a coating 0.001–0.25 inch to give ordinary iron corrosion-resistant qualities comparable to some stainless steels, according to **NY Testing Lab.** After the coating is applied, it is actually alloyed into the metal itself via heat applied in a reduction atmosphere (phosphorus in the alloy reduces the mp of nickel to make this possible). . . . Electrolytic perforated plates for filter uses, with openings as small as 5 microns, are being developed, and plated with uniform openings as small as 20 microns in different metals. . . . Nominal joint strength is affected by an adsorbed film on the metal surface and by the mechanical properties of the metal (the strength of adhesive-bonded metal joints can be made to approach the cohesive strength of the bonding agent, if metal surfaces are treated properly). . . . New copper alloys for making cast parts are Cu-As, Cu-Sb, Cu-Pb and Cu-Pb-Si, with and without small additions of Al, Cr, Fe, Mn, Ni, Sn and Zn. The Cu-Pb-Si bronzes (ingros bronzes) are said to yield castings with bright, oxide-free surfaces which can be polished and electroplated easily. . . . Sodium diochromate was found to rapidly cut down the NO_2 fumes given off by fuming nitric acid, and the **Army Chem Center,** Edgewood, Md., is designing a trailer for the AF which will contain a dichromate tank, a limestone mixing device and a pump to decontaminate and neutralize 600-gal of the fuming acid. Decontamination by sodium dichromate takes only 2–3 min. . . . A new-type automatic controller for continuous analytical control of gas or liquid streams of organic or inorganic reagents and products will be produced by **Mervyn Instruments,** England. It will not need continuous resetting, and can operate continuously for 1 month. It is based on a dispersing optical system. The associated electronic systems used "completely new" principles which make possible high standards of accuracy and stability. . . . KEL-F No. 90 grease, a new-type stopcock grease available from **Scientific Glass Apparatus Co,** Bloomfield, N. J., is a fluocarbon lubricant for metal, glass, plastic or ceramic parts. It is said to offer extreme lubricity, to be chemically resistant, and easily removed. . . . The versatility of electron microscopes in industrial applications was broadened greatly by a new microscope technique developed by *W. Ladd,* **Ladd Res Ind Inc.,** Roslyn Hts., N. Y. Using an X-ray-sensitive recording material which exhibits no grain under the electron microscope, micrographs were produced showing overlapping lead particles, and similar structure details previ-

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brightens zinc die castings by chemical polishing, protects against corrosion

NOW, FOR THE FIRST TIME you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

CORROSION RESISTANCE, TOO! New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

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CADMIUM—Platers' shapes.....
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COPPER—Electrolytic, domestic..
Custom Smelters' Price.
INDIUM—(Per Troy oz, commercia
IRON—Pig (per gross ton—2,240 lb
Scrap.....
LEAD—(Common) New York.....
St. Louis.....
MAGNESIUM—(Ingot F.O.B. New
(Sticks 1.3 in diam
MERCURY—(Per 76 lb small quan
NICKEL—Electrolytic Cathodes (sl
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estic	46.00¢
Price	48.50–49.00¢
mercial 99.97%)	$2.25
,240 lbs)	$54.50–62.00
	$38.00
s	16.00¢
	15.80¢
8, Newark)	35.95¢
n diameter, 100 lbs or more)	54.25¢
l quantities)	$265.00–268.00
des (sheets loose)	64.50¢
e F ingots and shot New York	
	66.92¢
	$103.00–104.00
	$120.00–125.00
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ce 1.000 fine. Buying price	90.50¢
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A 164 – 55.	Spec. for Electrodeposited Coatings of Zinc on Steel
A 165 – 55.	Spec. for Electrodeposited Coatings of Cadmium on Steel
A 166 – 55 T.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Steel (Tentative)
A 219 – 54.	Methods of Test for Local Thickness of Electrodeposited Coatings
B 117 – 54 T.	Method of Salt Spray (Fog) Testing (Tentative)
B 141 – 55.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Copper and Copper-Base Alloys
B 142 – 55.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Zinc and Zinc-Base Alloys
B 177 – 55.	Rec. Practice for Chromium Plating on Steel for Engineering Use
B 183 – 49.	Rec. Practice for Preparation of Low-Carbon Steel for Electroplating
B 200 – 55 T.	Spec. for Electrodeposited Coatings of Lead on Steel (Tentative)
B 201 – 55 T.	Spec. for Chromate Finishes on Electrodeposited Zinc, Hot-Dipped Galvanized, and Zinc Die-Cast Surfaces (Tentative)
B 242 – 54.	Rec. Practice for Preparation of High-Carbon Steel for Electroplating
B 252 – 53.	Rec. Practice for Preparation of Zinc-Base Die Castings for Electroplating
B 253 – 53.	Rec. Practice for Preparation of and Electroplating on Aluminum Alloys
B 254 – 53.	Rec. Practice for Preparation of and Electroplating on Stainless Steel
B 281 – 53 T.	Rec. Practice for Preparation of Copper and Copper-Base Alloys for Electroplating (Tentative)
B 287 – 54 T.	Method of Acetic Acid-Salt Spray (Fog) Testing (Tentative)

Sponsored by ASTM and AES and revised to September, 1955

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Lead-Tin-Antimony Plating
Electrotinning of Copper Wire from the Stannous Fluoborate Bath
Using the Interference Microscope for Thickness Measurements of Decorative Chromium Plating
Practical Methods for Treatment of Metal Finishing Wastes
Simultaneous Polarographic Determination of Cadmium and Zinc in Alkaline Cyanide Solutions
Metal Cleaning Studies Using Radioactive Tagged Soils
A Nonoxidizing Heat Test for Plating Adhesion
Solids-Liquid Separation in the Treatment of Metal Finishing Wastes
The Five Per cent Salt Spray and Its Acetic Acid Modification
Electrophoretic Deposition of Metallic and Composite Coatings
The Anodic Etch in Preparation for Plating
The Effect of Different Chromium Deposits on the Fatigue Strength of Hardened Steel
The Treatment of Certain Plating Solutions by Ion Exchange
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AMERICAN ELECTROPLATERS' SOCIETY

445 BROAD STREET, NEWARK 2, N. J.

"The New BELKE DOUBLE OSCILLATING CYLINDER

gives us

"more uniform distribution of plate according to quality control checks

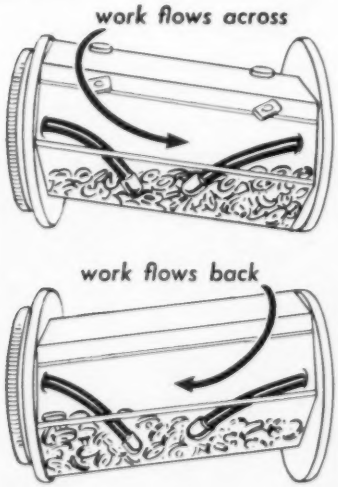
"noticeable color improvement on brass plating

"20% increase in load sizes."

Says Paul Glab,
Superintendent of Plating,
Northwestern Plating Works, Chicago.

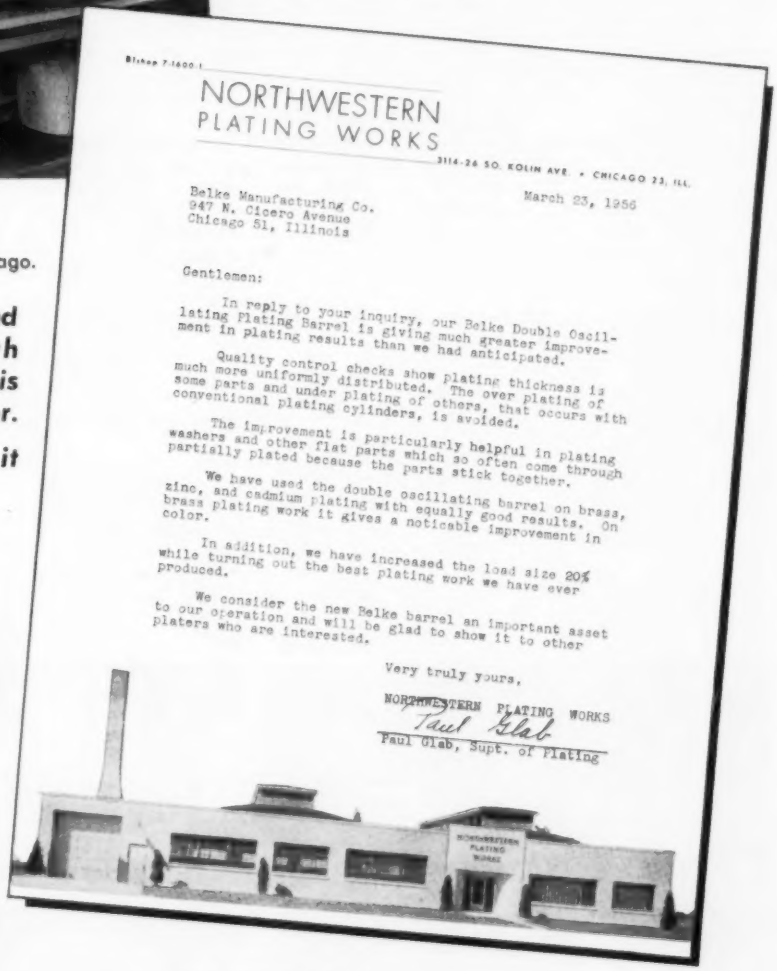
Improved Quality Control and increased production with lower cost are a cinch with this new BELKE Plating Cylinder.

The cylinder oscillates as it rotates



all sides of all parts are equally exposed to plating current. No part of the load stays at the ends where little plating occurs. No parts stay buried with greatly reduced exposure to plating current

Do you realize that this 20% saving in plating cost is all profit you are not getting now!



NORTHWESTERN
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Belke Manufacturing Co.
947 N. Cicero Avenue
Chicago 51, Illinois

March 23, 1956

Gentlemen:

In reply to your inquiry, our Belke Double Oscillating Plating Barrel is giving much greater improvement in plating results than we had anticipated.

Quality control checks show plating thickness is much more uniformly distributed. The over plating of some parts and under plating of others, that occurs with conventional plating cylinders, is avoided.

The improvement is particularly helpful in plating washers and other flat parts which so often come through partially plated because the parts stick together.

We have used the double oscillating barrel on brass, zinc, and cadmium plating with equally good results. On brass plating work it gives a noticable improvement in color.

In addition, we have increased the load size 20% while turning out the best plating work we have ever produced.

We consider the new Belke barrel an important asset to our operation and will be glad to show it to other platers who are interested.

Very truly yours,

NORTHWESTERN PLATING WORKS
Paul Glab
Paul Glab, Supt. of Plating

Ask your BELKE Service Engineer or write for literature.

Belke Manufacturing Company
947 N. Cicero Ave., Chicago 51

EVERYTHING FOR PLATING PLANTS

L—501. Hardbound Catalogue—For analytical and general research laboratories, pilot plant and production is a new 68-page, hardbound, two-color catalog on electric ovens, furnaces, water and oil baths, humidity cabinets and incubators recently published by Blue M Electric Co.

L—500. Two Electric Indicating Controls—Completely revised bulletin No. 1025B describes the Sarco LSI Electric Indicating Temperature Controller. A simplified operational sketch shows how this versatile LSI can be used to provide sequence control combinations such as.

Revised bulletin No. 1000B describes Electric room thermostats for factories and institutions. Also featured are immersion thermostats for hot water heating systems, unit heaters and alarm circuits and surface thermostats for low limit control on unit heaters.

L—502. Products and Specifications—A new catalog, listing products and specifications, has been released by Sigmund Cohn Corp. of Mount Vernon, N. Y. Metallurgists since 1901, this organization has built a wide reputation as specialists in small and unusual ribbon and wire. The new catalog is 24 pages in length. Some of the subjects covered under the heading "Precious Metals" are: Potentiometer Wire (including table of Diameter vs Resistance), Platinum, Platinum-Rhodium Thermocouples, Platinum for Resistance Thermometers, Commercial Forms of Platinum, Alloys for use in Semi-Conductors. . . . Under "Non-Precious Metals" are these subjects: Alloys for Vacuum Tube Filaments and Grids, Nickel for Resistance Thermometers, Wire and Ribbon, Thermocouple Wires. Whole sections are devoted to Electroplated, Etched or Coated Wires, Plating

By Specialists in Ribbon and Wire

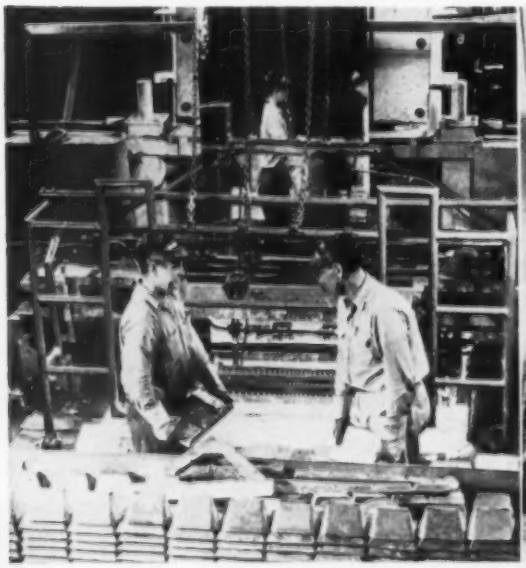
Solutions (Rhodium and Gold), Galvanometer Suspension Strips, Wollaston Process Wire. . . . Many helpful tabulations for handy reference appear throughout the catalog, including: Table for Weight per Foot Platinum Wire, Properties of Some of the Common Metals, Brown and Sharp Gauge Sizes.

L—503. Color Movie—A new 16 mm sound and color motion picture, "Zinc Controls Corrosion" has been produced by The American Zinc Institute, Inc., national trade association for the zinc industry. Available for showing after March 15, the new AZI film dramatically tells how zinc in its role of "protector" controls corrosion to lengthen life, and to minimize maintenance and replacement costs.

The film, which has a running time of about 35 minutes, presents a colorful demonstration of the general mechanism of corrosion as well as how zinc controls it. It gives pictorial evidence that a sound corrosion-prevention program based on the use of zinc will lengthen the life of steel products, markedly reduce maintenance costs, and increase net earnings.

Bookings for "Zinc Controls Corrosion" are now being accepted at The American Zinc Institute, Inc. The new film is available for showing at no charge. Special booking forms can be had on request.

A heavy coating of zinc gives many common steel products long lasting protection



Producing galvanized strip from one of the new continuous hot dip galvanizing lines. The sheet is just emerging from the bath of molten zinc

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NEW DEVELOPMENTS
from
THE CHEMICAL CORPORATION
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A dark, hard, stable olive drab coating. Applied in about 15 seconds at room temperature. Gives maximum corrosion protection. Meets most rigid specifications. Available in one package.

LUSTER-ON D
A powdered product to produce a bright clear conversion coating on zinc and cadmium.

LUSTER-ON ACTIVATOR
Designed for preparing a zinc alloy die casting prior to treatment in our Luster-On acid baths. Also serves as a mild cleaner. However, heavy soil must be handled by a precleaner.

LUSTER-ON NS
The answer to "spotting out" troubles on thin copper and brass plate, especially under humid conditions. Improves adhesion, provides leveling action, saves lacquer. Eliminates fingerprints before assembly.

LUSTER-ON ALUMINUM SEALER (222-M)
Produces a chromate film on aluminum that provides excellent corrosion protection and can serve as a paint base. Now can be dyed in many attractive pastel colors. Meets requirements of Government Spec. MIL-C-5541.

Ask for literature. Send a sample for free laboratory treatment.

Luster-On products are manufactured on the West Coast by Crown Chemical and Engineering Company of Los Angeles, Calif., and in the Dominion of Canada by Alloycraft Limited of Montreal, Quebec.

You'll also be interested in our SafetyDivision's line of industrial skin cleaners and protectors . . . protect your workers and your products. Literature available.

L-10

THE Chemical CORPORATION
57 WALTHAM AVENUE
SPRINGFIELD, MASS.

TRADE-LITERATURE

L—504. Rinsing Hints—"Good Rinsing for Good Plating" is the title of this four-page, illustrated reprint which gives the seven basic ways for improving rinsing. It shows how rinse water impurities build up in plating tanks, gives a method for calculating water flow rates and for saving on water, methods for agitating rinse water, the effect of temperature on rinsing and various other factors that control the quality of the rinsing operation.

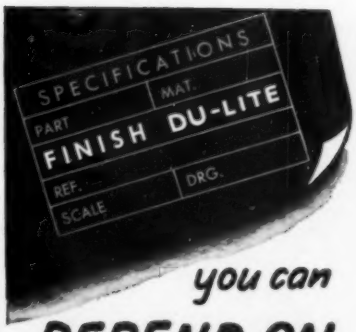
L—505. Duct Installation—A new brochure describing how silver cloth tape aids in duct installation has been prepared by the Permacel Tape Corporation. The brochure, printed in red and silver, points out that use of silver cloth tape speeds duct installation work and requires less labor than old-fashioned methods.

L—506. Sn—The Tin Research Institute's report for 1955 deals fully with the progress of research work on hot-tinning, tinplate, soldering, electrodeposition, metallurgy and organotin compounds. There is a large section devoted to the Institute's activities at conferences, lectures, exhibitions and in broadcasts and films. Another main section of the Report reviews activity in each of the Institute's overseas branches in Belgium, Canada, France, Germany, Holland, Italy, Sweden, and the U. S. A. There is a list of the scientific papers originating at the Institute during the past year and also a long list of articles contributed to the technical press.

L—507. Rheostats—A recently issued catalog bulletin, Section 500 (Form TR-10256) covering Columbia Cast Grid Type Tank Rheostats is available. Ampere ratings from 15 to 5000 amperes, 1 to 6 volt drop, are the ranges of the rheostats covered.

Features include—rugged cast grid construction; self-cleaning, readily accessible toggle switches for positive contact; liberal overload capacity; contact surfaces of hard drawn copper; connections at front of panel to facilitate installation and permit straight line bussing.

L—508. From G.E.—Electric heaters and heating devices—Bulletin GEC-1005G, 60 pages, contains application index, calculating data, specifications, operating information, and list prices of standard G-E heaters and heating devices. Included are immersion, strip, cartridge, tubular, fin, and railroad switch heaters; unit heaters, soldering irons, glue pots, soft-metal melting pots, oven equipment, and control. Process and application index shows methods of heating and type of heater recommended for various heating processes.



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DEPEND ON
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to meet your specifications

Du-Lite black oxide finishes for steel, stainless, copper, zinc or malleable iron provide a uniform, durable surface without altering the dimensions or physical characteristics of the metal. That's why they are often specified right on the blueprint.

And since the Du-Lite process is simple, flexible, and imposed at non-critical temperatures, you can depend on the results to meet your specifications—always.

Du-Lite black oxide finishes also meet govt. specs. MIL-F-13924, superseding 57-0-2C Type III Class A for steel and Class B for stainless (Type II Class B and C phosphates), and MIL-P-12011, superseding 51-70-1A para. 22.03 Class C for Copper and Copper Alloys.

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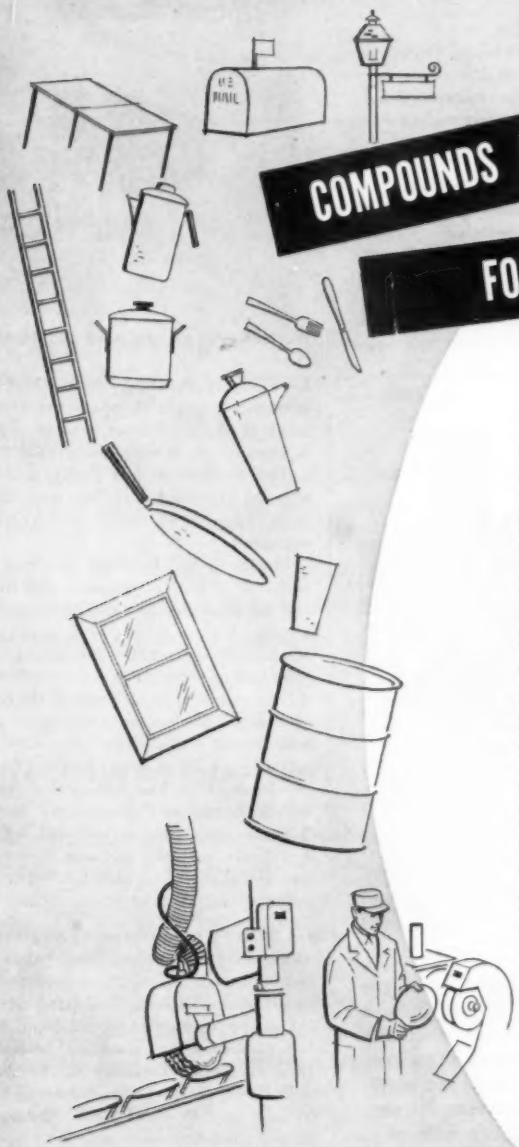

COMPOUNDS DESIGNED EXCLUSIVELY FOR ALUMINUM FINISHING!

H-VW-M long ago anticipated today's tremendous popular demand for aluminum products—by developing special compounds like Liquimatic 728 to suit the unusual characteristics of this soft metal. Heavy-duty Liquimatic 728 is formulated *expressly* for aluminum finishing. It's a true double duty compound, combining special cutting qualities with excellent coloring properties. And it works so clean, and cleans so easily that it's especially suited for buffing before anodizing. For color anodizing, too, it brings out deeper, richer tones every time.

Liquimatic 728 is just one of a full line of H-VW-M liquid and bar compounds developed solely for use in aluminum finishing. And it's not only compounds that H-VW-M supplies to make aluminum finishing easier . . . faster . . . *better.* In the H-VW-M line you'll find anodizing equipment—automatic buffing machines and other equipment—all types of buffs—everything you need, in fact, from start . . . *to finish!*

Write today for bulletins describing the H-VW-M equipment, supplies and compounds designed especially for aluminum finishing.

PLATEMANSHIP

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING CO. MATAWAN, NEW JERSEY U.S.A.

H-VW-M

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INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

L—509. Rubber Lining Tanks, Valves, Fittings—An illustrated, two-color, 8-page bulletin describing the advantages and application of rubber lining to steel tanks, drums, pipes, valves, fittings and pumps, is being offered by the Protective Coatings Division of Metalweld, Inc. Included in the bulletin are important tables giving the resistance characteristics of MW rubber lining to inorganic acids, salts and alkalies, organic materials and a wide group of miscellaneous materials. Details on the chemical, abrasive and temperature resistant qualities of rubber linings and the different types of linings available are also given.

L—510. Degreaser—The CIRCO Model OPNT Vapor Degreaser is described in a technical bulletin available from Circo Equipment Company, Clark (Rahway), N. J.

L—511. Solenoid Valves—A new, comprehensive catalog from Atkomatic Valve Co., Inc. describes the company's complete line of electrically operated two-way solenoid valves for air, gas, steam and liquid flow control.

Free on request, the catalog lists available dimensions, specifications, pressures and applications of solenoid valves in bronze and stainless steel. All Atkomatic valves are custom built and individually tested for a diversity of industrial uses. The illustrated catalog also contains numerous coil and flow charts and other useful information.

Electrical—for air, gas, steam and liquid flow

L—512. Unfouling Beds—A highly informative paper discusses the development of the sub-surface washer, used in demineralizers, Zeolite softeners and filters.

The problem of bed fouling of filters and ion exchange units has been one of great concern to design and operating engineers.

Mostly caused by dense or sticky precipitates or fibrous material, bed fouling can become costly. It cuts down the length of run, causes more operational attendance and can necessitate expensive resin bed replacements.

This technical paper presents the causes of fouling and the problems encountered with actual installations in a variety of industries. The steps leading to the development of the sub-surface washer are presented and a cut-away drawing showing this unit is included. Other descriptive material includes flow sheets and a diagrammatic sketch of pilot unit observations.

L—513. Ultrasonics—The benefits which may be derived from ultrasonic techniques in cleaning and degreasing, electroplating, drilling and grinding operations are reported in new Bulletin MW-103 published by Acoustica Associates, Inc., Glenwood Landing, L. I., N. Y.

Entitled, "Ultrasonic Barrier Broken by Low Cost Power Supply," the 4-page, 2-color bulletin also describes various ultrasonic power supplies, transducers, and systems offered by Acoustica for small and large scale production requirements.

L—514. Air Devices—A fully illustrated, four-page circular, describing its complete line of air devices, has been prepared by the Lunkenheimer Co. of Cincinnati, Ohio, currently in its 94th year. Lunkenheimer air devices, specifically designed to eliminate costly air leaks, meet all requirements for lasting, low-cost service. Dimensions, pressure requirements and complete descriptive information on each device in the complete line are included in the circular.

BOTHERED BY THE HIGH COST OF TANK LINING FAILURES?

Tygon linings are really economical. Not necessarily from the standpoint of low first cost (which can be very misleading), but more important, they provide greater corrosion resistance — more positive protection, hence *longer trouble-free service life.* Tygon's outstanding resistance to oxidizing acids, alkalis, oils and greases make it suitable for jobs too tough for other lining materials to handle. Excellent dielectric properties guard against current loss. Non-oxidizing, flexible, and resilient, it resists aging, wear and abrasion.

Where solution visibility is important, Tygon *white* linings permit maximum visual quality control. Seamless, jointless Tygon linings are installed by a licensed Tygon applicator in your area, reducing delivery time and freight costs to a minimum.

Tygon is the perfect membrane for oversheathing with USSCO acid brick. Built-in-place tanks, tank piers and foundations are lined at your plant to your specifications by trained field applicators. And our engineering service stands ready to help with all your lining problems.

257-E

Send for your copy of the fact packed, illustrated Tygon Lining Bulletin No. TL-526

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12 volts, 1000 amps . .	$1616.00*
12 volts, 2000 amps . .	$2465.00*

*Manufacturer's suggested user price.

NOW EVERY PLATING SHOP can take advantage of the long life and operating savings of germanium with:

1 **THE UNIQUE G-E TRUE HERMETICALLY SEALED GERMANIUM CELL**—that safeguards the germanium from corrosive atmosphere.

2 **THE UNIQUE G-E GERMANIUM PROTECTIVE SYSTEM**—the first protective device designed specially to help safeguard the germanium cell against all types of overloads. Provides an original advance-warning feature to help prevent costly, sudden shutdowns.

3 **GENERAL ELECTRIC EXPERIENCE IN GERMANIUM**—over 13,000 kilowatts (2,000,000 amperes at plating voltages) of germanium rectifiers installed and operating. General Electric Co., Schenectady 5, N. Y. 463-14

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Prices refer to integral tap switch unit shown here.

CALL YOUR AUTHORIZED GENERAL ELECTRIC PLATING AGENT TODAY.

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BELKE MFG. CO., Chicago, Ill.
THE CHEMICAL CORP., Springfield, Mass.
CLEVELAND ELECTRIC CO., Atlanta, Ga.
FITZPATRICK ELECTRIC SUPPLY CO., Muskegon, Mich.
COMCO, INC., New Haven, Conn.
W. M. FOTHERINGHAM CO., Buffalo, N. Y.
GENERAL ELECTRIC SUPPLY CO., Cleveland, Ohio
FRED GUMM CHEMICAL CO., Kearny, N. J.
LASALCO, INC., St. Louis, Mo.
LEA MANUFACTURING CO., Waterbury, Conn.
WILLIAM LYNN CHEMICAL CO., INC., Indianapolis, Ind.
F. B. STEVENS CO., Detroit, Mich.
MEAKER CO., Cicero, Ill.
GEORGE L. NANKERVIS CO., Detroit, Mich.
THE REYNOLDS CO., Philadelphia, Pa.
STANDARD PROCESS CORP., Chicago, Ill.
UDYLITE, Detroit, Mich.
S. A. DAY, Buffalo, N. Y.

L—515. Metallic Cleaners—A four-page bulletin on the application of Matawan cleaners in preparing metallic surfaces for electroplating, anodizing, painting and other decorative or protective coatings is offered by the Hanson-Van Winkle-Munning Company, Matawan, N. J.

The bulletin explains the different types of metallic cleaning processes: soak cleaning, electrocleaning, barrel cleaning, spray washing machine cleaning, and specific purposes cleaning. A reference chart is included, showing the proper cleaner and process to be used with aluminum, brass, copper, steel, lead, magnesium, tin and zinc.

L—516. Rheostats—An illustrated, four-page bulletin on the new H-VW-M universal carbon pile tank rheostats for electroplating is available from the Hanson-Van Winkle-Munning Company, Matawan, N. J.

The bulletin describes the advantages of the tank type of rheostat, which provides all tank voltages for specified line voltage and maximum amperage conditions. A standard rating chart is provided, together with instructions on how to select the proper H-VW-M carbon pile tank rheostat.

L—517. Germanium Rectifiers—General Electric's bulletin 1204 gives general information on industrial uses of germanium rectifiers, including characteristics, construction, advantages, and design and application considerations.

L—518. Two New Bulletins—The Cyclemaster bulletin describes the latest development in Udylite's full automatic plating machines.

The bulletin on the Udylite—Detroit Filter describes the entirely new line of filters which are very economically priced.

L—519. Spectroanalysis—A 4-page bulletin describing a moderately-priced instrument for the qualitative and semi-quantitative analysis of 61 elements—the new Fisher-Todd Spectranal—is offered by Fisher Scientific Co.

L—520. Solvent Detergent for Power Washers—A recently published folder describes the properties of a solvent detergent which is said to clean and protect against rust at the same time. The material, Oakite Composition No. 98, was designed especially for use in power washing machines.

The folder suggests the use of this material for cleaning metal between machining operations and protecting metal for temporary storage. It lists five other advantages claimed for Oakite Composition No. 98—economy, safety to all metals, no flash point, bland odor, fast and even drying, and easy removal when production is to be resumed. The folder also gives recommended solution concentrations and temperatures for single and two-stage washing machines.

L—521. Corrosion Proof—Atlas Bulletin CC No. 3 is a new 16-page bulletin giving basic data on the complete line of corrosion proof construction materials manufactured and installed by The Atlas Mineral Products Company, Mertztown, Pa. This bulletin contains chemical and physical data, estimating data and descriptions of products used for acid proof installations in the metal working, chemical, petroleum, pulp and paper and other industries.

Included in the bulletin are sections on corrosion proof cements, tank linings, protective coatings, rigid plastic fabrications and rigid plastic pipe, plus a chart showing their resistance to various chemicals.

L—522. 1956-57 Catalog—A new 1956–57 general catalog of low-voltage electrical distribution equipment and components has been announced by General Electric's Trumbull Components and Distribution Assemblies Departments, Plainville, Conn.

The 160-page, two-color publication provides a single, bound reference for the products manufactured by these two G-E departments and marketed through General Electric's Assemblies & Components Sales organization. It is designed to provide engineers, contractors and purchasing agents with a reliable source of information for specifying electrical power distribution equipment and components for applications up to 600 volts.

meet our star salesman

Our best "door-opener" and "contract-closer" is the product itself. On its merits it has built us a "blue chip" customer list.

Why not see for yourself how good BFC Chromic Acid really is by sending us an order to cover your next spot need?

BETTER FINISHES & COATINGS, INC.
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5 Rapid Selenium Rectifiers form Power-Packed Line-up at Warner & Swasey

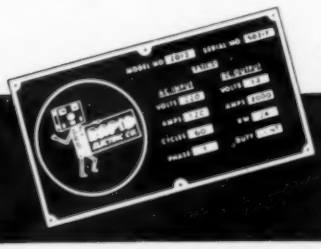
Warner & Swasey's chromium plating installation features a power-packed line-up of five Rapid Selenium Rectifiers. It's Rapid power, then, along with extensive know-how and other excellent equipment that helps Warner & Swasey turn out only quality chromium plating which is in keeping with their reputation for building the finest of precision, metal-turning machine tools.

"Multiple Rapid" installation such as this are not uncommon. Because, once a plater buys a Rapid Rectifier, he almost always buys more as his power needs increase. Additional Rapid Rectifiers are specified because of the complete satisfaction derived from the efficient, dependable, low cost performance of the original unit. It is this feeling of satisfaction on the part of our plating customers that is responsible for Rapid's growth in the industry.

Plating men know that when they specify Rapid for their DC Power needs, they are getting first of all, an engineered DC power supply which gives them six square inches per ampere of plate surface and many other "plus" features, such as:

- **Long-time service**
- **High efficiency**
- **No lost time due to burnouts**
- **No loss of efficiency due to overheating**
- **No supervision needed**
- **No maintenance needed**
- **Maximum Safety Features**

Our engineering department is available for consultation on any application of Direct Current Power Supplies. Avail yourself of this professional service without obligation.



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RAPID ELECTRIC COMPANY

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L—523. Bibliography—A bibliography of current periodical references to powder metallurgy has been published for metal-working people interested in this relatively new process. It was prepared by the Harper Electric Furnace Corporation, Buffalo, N. Y., manufacturer of continuous sintering furnaces.

L—524. Bound Bulletins—Technical Bulletins on heat treating, plating, finishing and allied compounds are now available bound in an attractive, permanent cover from The Swift Industrial Chemical Company, Canton, Conn.

L—525. New Applications for Surfactants—Drastic and dramatic modifications with surfactants can improve products, reduce processing costs, and enhance business potential. Foster D. Snell, Inc. describes the new role of surface chemistry in modern technology in a new booklet entitled, "Explore, Expand, and Diversify with Surface Chemistry at Foster D. Snell, Inc."

L—526. Water Still Catalog—A new forty-eight page catalog provides comprehensive technical information on the complete range of Barnstead Water Stills—from the well-known laboratory models to the large industrial units producing thousands of gallons per day.

An outstanding feature of this handsome and detailed catalog is the seven-step, pictorialized description, "How a Barnstead Still Operates." Description of automatic controls and operating controls are also included.

For pure clean water

Concise descriptions, numerous photographs, clear, readable tabulations make this unusually useful and essential reference book for anyone who uses distilled water, whether it's for large-scale production operations, industrial research projects, or important laboratory work.

L—527. Instruction Manual on Nickel Plating—An illustrated 20-page instruction manual on bright nickel plating by the Nickel-Lume process is offered by Hanson-Van Winkle-Munning Co., Matawan, N. J.

The three techniques for electrodepositing by the H-VW-M Nickel-Lume process are described: Nickel-Lume Type I, for use in still tanks or with conveyors where work loads are in mild motion; Type II, for use with air agitation; and the barrel process for plating in cylinders.

The manual explains the proper bath preparations for these processes, the converting of existing baths to Nickel-Lume, and the effect of the important constituents. Solution maintenance, purification, handling of equipment and materials are discussed. Analytical procedures, for all of the constituents, including the addition agents, are outlined.

Plating of special equipment such as marine hardware, automobile bumper guards, surgical instruments (which can be sharpened after plating), electric irons, toasters and grills which must retain their bright finish after extreme temperature changes, is fully described and illustrated.

L—528. Chemical Rubber—How to obtain rubber products with greater resistance to deterioration is described in a new publication for industrial designers and engineers. The eight-page booklet tells how Hypalon chemical rubber has solved numerous problems in product design and plant maintenance.

Put your metal cleaner *behind* the soil—between the soil and the metal—and you'll soon have the soil *off* the metal. That's the way you'll clean metal parts with . . .

Cowles NEW QC WASHING MACHINE CLEANER

Cowles NEW QC Washing Machine CLEANER penetrates through films of oil—crusts of drawing and stamping compounds—even into deeply recessed parts—pries the soil loose where pressure jets can't reach.

Improved penetrating, wetting, and emulsifying action in your washer without objectionable foaming.

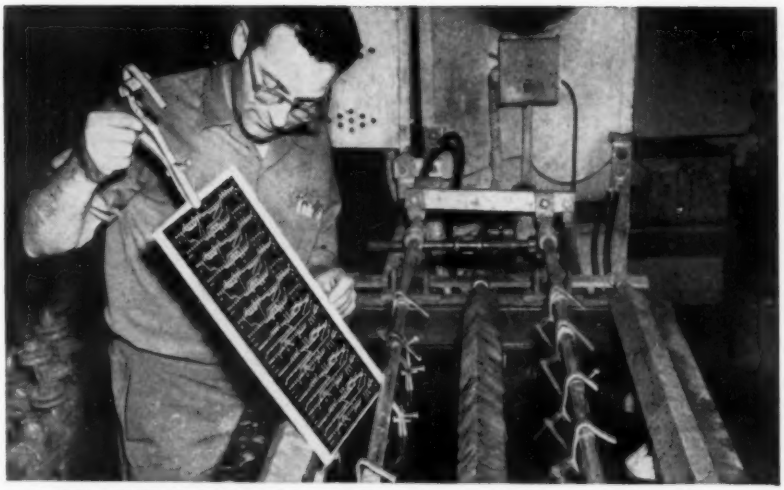
GET THE COMPLETE STORY on this *brand NEW* Cowles QC Washing Machine Cleaner. **Send This Coupon.**

Cowles Chemical Company
7018 Euclid Avenue
Cleveland 3, Ohio
Please send Cowles QC Bulletin
Name_____
Company_____
Address_____
City_____ State_____

Cowles CHEMICAL COMPANY
CLEVELAND 3, OHIO

See Cowles NS and FE advertisements on pages 600 and 612.

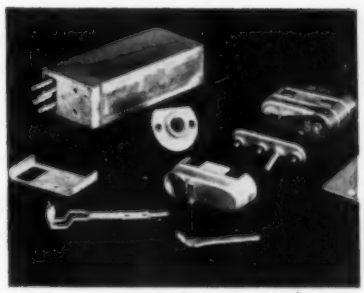
How You Can PLATE Faster, Better



PRINTED CIRCUITS—*Low cost, easily assembled printed circuits for radio and other electronic equipment may be plated economically and efficiently with B&A Copper Fluoborate and B&A Lead-Tin Fluoborates.*

PLATING VERSATILE LEAD-TIN ALLOYS—*Lead-Tin alloys of low tin content can be plated from the fluoborate bath to give excellent protective and lubricating coatings for vital engine parts and bearings.*

PLATING ELECTROTYPE SHELLS—*B&A Tin Fluoborate for plating electrotype shells prior to casting offers an easily controlled bath. A combination lead-tin bath has also been used successfully. The Copper Fluoborate bath is used for high speed forming of electrotype shells.*



EASILY SOLDERED COATINGS—*A high tin-content Lead-Tin Alloy Fluoborate Bath produces easily soldered coatings on electronic or electrical parts. The Tin-Fluoborate bath can also be used. These uniform deposits help expedite assembly.*

The standout performance of B&A Metal Fluoborate Solutions in Lead, Tin, Iron, Copper, Nickel, Cadmium and Indium plating is news of greatest importance to platers. These B&A products permit far faster plating rates, and provide platers with a host of other advantages not available *in any other plating agents!*

In alloy plating, for example, they offer the only fast, efficient way to plate Lead-Tin and Lead-Tin-Copper alloys – simultaneously – at easily controlled ratios. *In Cadmium plating,* outstanding results are obtained without the hydrogen embrittlement common to other methods. *In Lead-Tin alloy plating,* they produce coatings with excellent solderability that is not destroyed by aging. Other applications include high-speed copper-plating of plastics, copper-plating of steel wire and copper under-coatings prior to nickel plating.

For a descriptive folder, for experimental or commercial quantities, operating data—or for free technical consultation—write or phone your nearest B&A office.

HIGH SPEED WIRE PLATING—*The fast plating rate of B&A Copper Fluoborate makes possible high-speed electrocladding of steel wire. And the Tin Fluoborate bath is used for high speed electro-tinning of copper wire*

B·A STANDARD OF PURITY

BAKER & ADAMSON® Fluoborate Solutions

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Offices: Albany* · Atlanta · Baltimore* · Birmingham* · Boston* · Bridgeport* · Buffalo* · Charlotte* Chicago* · Cleveland* · Denver* · Detroit* · Houston* · Jacksonville · Kalamazoo · Los Angeles* · Milwaukee Minneapolis · New York* · Philadelphia* · Pittsburgh* · Providence* · St. Louis* · San Francisco* · Seattle Kennewick* and Yakima (Wash.)
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In Canada: The Nichols Chemical Company, Limited • Montreal* • Toronto* • Vancouver*

GC Allied Chemical

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 539.

Equipment and Supplies...

E—529. Tilting Tumbler—The model DM-PT series is the newest in the line of Globe tumbling barrel equipment which has served industry since 1902. Manufactured by the Globe Division, Casalbi Company, Jackson, Mich. The model DM is engineered for versatility and operator convenience. The Power Tilt provides easy loading, rinsing and unloading. Push button control starts, stops and regulates up and down movement.

Cubical content ranges upward to 23 cubic feet and maximum load capacity of the largest Globe Model DM is 1500 pounds. All 5 models are available with round, octagonal or flask type shells, made of hard maple or steel (with or without neoprene lining).

E—530. Grinding Segments—V-40 Bond Segments, for grinding all ferrous and non-ferrous metals, have been developed by The Carborundum Company and are now commercially available for immediate delivery.

Made of the highest grade of aluminum oxide abrasive grain, and with the same specially engineered bond as developed for Carborundum's widely accepted V-40 Tool Room Grinding Wheels, the V-40 Segments are made in the variety of shapes used in all standard chucks.

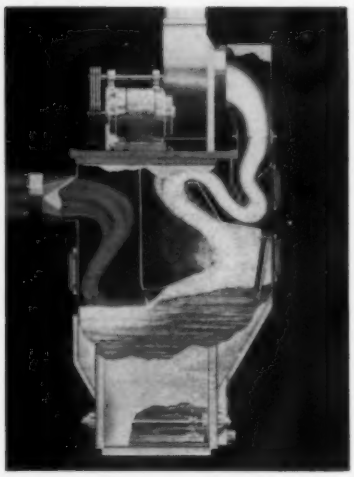
These abrasive segments have been specially designed for generating flat surfaces on plates, castings and machine parts and grinding machine knives.

E—532. Imitator Paint—A new all-purpose aluminum paint that produces a simulated hammered finish is announced by Speco, Inc., Cleveland.

Known as Halum, the new paint utilizes a specially-formulated, doubly-pigmented aluminum base which forms an attractive, bright finish closely resembling hammered metal. In addition, the coating is said to be highly resistant to fumes, oils, grease, mild industrial acids, adverse weather conditions and other common corrosive agents.

According to the manufacturer, Halum air dries in 24 hours, making it ideal for a large number of interior and exterior applications. Among its recommended uses are railings, sashes, metal covers and housings, ventilator outlets, standpipes, gutters, downspouts and machinery.

E—533. All-Purpose Lubricant—Primaleen, the all-purpose lubricant is now available nationally according to the manufacturers, Protecto Lube Co. It cuts costs, direct and indirect and can be applied up to 90 times less frequently than ordinary greases. Its tenacity and ability to fill the pores of the surface lubricated makes it outstanding in reducing friction at high pressures, high sliding velocities, and close clearances. Possessing Thixotropic characteristics, it will not drip even when afire! Primaleen resists water, chemical vapors, and temperature changes.



E—534. Wet Dust Collector—Persons responsible for controlling industrial dusts will be interested in the new "Ventrijet" wet dust collector manufactured by the Pangborn Corporation, Hagerstown, Md. The "Ventrijet" achieves the proper atomizing of water and mixing with the air stream to permit efficient dust transfer by the movement of air without mechanical means.

Dust laden air enters the "Ventrijet" collector and expands in the inlet chamber at reduced velocity. The heavier particles sink to the bottom of the tank as sludge. The air is drawn through one or more venturi tubes into the discharge chamber. The low pressure area in the venturi throat induces water also to enter the high velocity air stream. The mixing of air and water causes the transfer of dust particles from the air to the water particles. The air, water and sludge mixture impinges at high velocity on special surfaces in the discharge chamber. The sludge settles to the tank bottom. The washed air then flows through an eliminator section for removal of droplets and clean air is discharged.

The Pangborn "Ventrijet" is available in a range of capacities from approximately 1,000 to 30,000 cfm in single and double row tube types.

E—535. Strippable Paint Booth Coating—Oakite Shield, a sprayable paint booth coating that strips off in large pieces in seconds, has recently been introduced by Oakite Products, Inc.

Applied by either spray or brush to dry booth surfaces, the new material is said to dry fast and to cling tightly to vertical surfaces under paint over-spray. When painting has been completed, the Oakite Shield film peels off readily with a minimum of prying with a knife and a minimum of shredding.

The new product is said to have the consistency of paint, to be odorless, non-toxic, and non-hazardous to store and use. Men using it need not wear respirators.

E—531. Rough Finish Coated Gloves—Surety Rubber Company, Carrollton, O., manufacturers of rubber and coated fabric work gloves has announced a new rough-finish coated fabric glove designed to provide a positive grip and withstand oils, acids and solvents.

Sold under the trade name, Surety Griptite Coated Work Gloves, they are available with coated palm and knit wrist or fully coated with knit wrist, twelve-inch gauntlet or safety cuff. Women's sizes with coated palm are furnished with knit wrist only.

Tight Grippers

New SCHAFFNER BIAS buffs

give more mileage ...

because

- ... FULLY VENTILATED
- ... COOLER RUNNING
- LOW COMPOUND CONSUMPTION
- ... FEWER SECTIONS NEEDED
- ... GIVES LONGER LIFE
- ... LATHE FACED AND BALANCED

Manufactured and controlled in our own new modern up-to-date Buff plant. Can be tailor made for your toughest buffing problem

MADE BY THE MANUFACTURERS OF FAMOUS AND ACCEPTED SCHAFFNER NO NUBBIN BUFFING COMPOSITIONS.

CLIP TO YOUR LETTERHEAD

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manufacturing company, inc.
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Phone ROsewood 1-9902

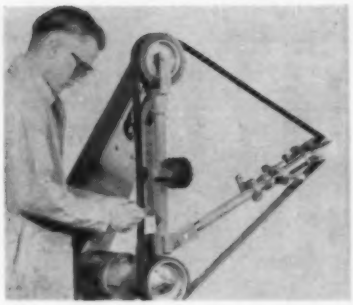
Please send me catalogue and complete information:

NOW PRESENTLY USING _____ Name, Manufacturer and _____
DIAMETER _____ Code No. of Buff _____
CENTER SIZE _____ CENTER SIZE _____
PLY _____ ARBOR _____
NORMALLY I USE _____ SECTIONS PER MONTH _____ COUNT _____
NAME _____ TITLE _____
COMPANY _____ STREET _____
CITY _____ ZONE _____ STATE _____

SCHAFFNER AIR-COOLED METAL-CENTER BUFFS ARE PRICED RIGHT • PRODUCED IN ALL DIAMETERS, CENTERS, PLYS AND COUNTS

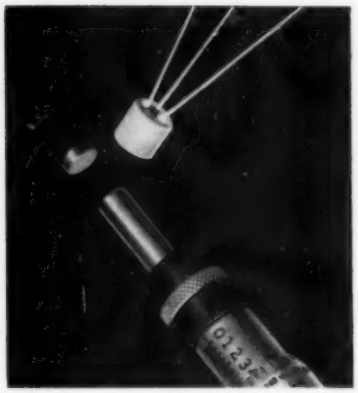
EQUIPMENT & SUPPLIES

E—536. Hardfacing Powders—Nickel base alloy powders for hardfacing that can be sprayed from various types of guns and applied to practically all metals with melting points above 1850° F, have been developed by Western Carbide Corp., subsidiary of Superweld Corp., No. Hollywood, Calif. Called Hi-C Spray Powders, the new product provides a homogeneous deposit of high hardness with excellent resistance to wear, corrosion and oxidation at high temperatures. Suitable for use in automotive, electrical, farm tool and earthmoving equipment industries, the spray powders permit the selection of any Rockwell C hardness required. The number following the Hi-C designation indicates the Rockwell C scale hardness; a Hi-C 60 spray powder has a minimum Rockwell C scale hardness of 60. Hi-C spray powders are available in hardnesses of 40, 50, and 60.



E—537. Versatile Abrader—The Curtis Machine Corporation (Jamestown, N. Y.) has announced the manufacture of Model DBA-1F Flex-A-Belt, a machine on which it is possible to perform any of the basic abrasive belt applications found in a grinding, polishing or deburring department.

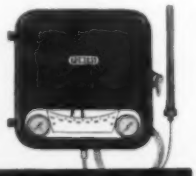
The extension arm assembly can be rotated a full 360° on the motor hub for the most convenient operating position for the various applications. Only on the Flex-A-Belt can the following operations also be performed: formed contact wheel grinding operation on a contoured piece; flat grinding application on a platen; direct contact wheel grinding operation with a work rest; grinding or polishing operation on a hard-to-get-at area with interference-free idler contact roll.

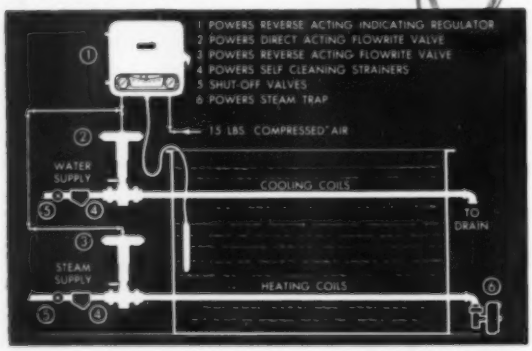


E—538. Sub-Miniature Selenium Relay Rectifier—A new versatile subminiature selenium relay rectifier to energize dc relay coils has been developed and is now in production at International Rectifier Corporation. This new unit, Type 60-9267, is a full wave center tap rectifier and may be used either as a center tap full wave rectifier or as a half-wave and "back-wave" rectifier combination for compact relay power supply. The new rectifier is rated for 66 v maximum a-c input and will deliver 22 ma d-c at center tap or 11 ma as half-wave and is designed to operate in an ambient temperature range of minus 50° C to plus 100°C.

POWERS

CAN HELP YOU — if you want precise control for a process with both HEATING and COOLING.





Application above is typical of thousands of installations now accurately under control by POWERS. Whether your problem calls for control of heating and cooling of liquids or air, Powers has the right control and experience to help you get the results you want. Bull. 370 describes the Temperature Indicating Controller shown above. Write for a copy.

(c6)

THE POWERS REGULATOR CO.
Skokie, Ill. • Offices in 60 Cities

Over 60 Years of Automatic Temperature and Humidity Control

CHROMATE CONVERSION COATINGS

PROSEAL #9—A dry powder for bright or bronze phase or zinc and bronze phase on cadmium. No carboys needed—mix with water and acid.

Proseal #16—prevents the corrosion of aluminum in electrical application—replaces anodizing—affords better corrosion protection. A superior base for organic finishes.

Proseal #32A—inexpensive way to brilliant, protective surfaces on plated zinc—used as a final finish.

Proseal #33—single bright dip for good corrosion protection of plated cadmium—has no color or iridescence.

Meets all government specifications.
Send for technical data sheets.

THE Swift INDUSTRIAL CHEMICAL COMPANY
ROUTE 44 CANTON, CONNECTICUT

FOUNDATION
makes the difference

put your finish on a sound phosphate base . . .

NORTHWEST INTERLOX

Interlox was developed by Northwest's Cleaning Specialists to give you a better, more corrosion resistant, more easily controlled phosphate base for your organic finishes. It exceeds most government specifications.

Deposited as a fine, dense grain coating, Interlox is designed for spray or immersion type baths—zinc phosphate coatings or iron phosphate coatings.

Interlox deposits at a very rapid rate thus assuring a high-quality, uniform coating throughout the unusually long life of the bath.

Northwest's production-tested chemicals and "Right the First Time" recommendations will save you money. For the complete story on Interlox or any of the other Northwest Chemicals write or phone for a Cleaning Specialist.

Got a problem? Let our cleaning experts help you!

LO HI pH

NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

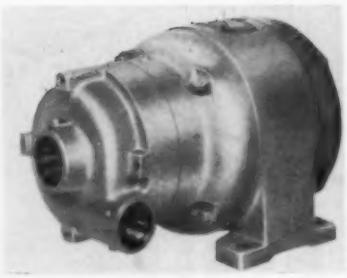
pioneers in pH cleaning control *serving you since '32*

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 543.

EQUIPMENT & SUPPLIES

E—539. Pumps—A complete line of centrifugal pumps having almost twice the capacities and head pressures of pumps of equal size and horsepower, has been introduced by Bart Laboratories, Division of Bart Manufacturing Corporation, Belleville, N. J. Known as the Bart "Flex-Seal" Centrifugal Pumps, the units are constructed of special stainless steel throughout, for protection against corrosion and product contamination in a wide range of applications.

Other features of the Bart "Flex-Seal" Centrifugal Pumps include: double capacity and head pressure ratings operating at 60 per cent to 70 per cent efficiency range; specially designed close coupled junction between pump and motor assemblies which permits quick, easy seal replacement by any shop workman; new "pre-set" two-piece seal, which requires no adjustments after installation; and "on-the-job tested" basic design which, it is reported, reduces maintenance to the absolute minimum and simplifies any servicing which might be required.



Centrifugal Type

Feeder Control

E—540. A Recorder and a Feeder—After many months of research and field testing the F. D. Pace Co. of Grand Rapids, Mich. has developed two radically new pieces of equipment for the plating trade. The first of these is a new ampere-hour recorder which employs a fully electronic circuit. The ampere-hour recorder fits any size of shunt and does not require calibrated leads. It connects to the same shunt to which the ammeter on the rectifier or generator is attached. Simple multipliers are used depending upon the size of the shunt to which it is attached. The instrument is claimed to be accurate to within 2 per cent. Because an additional shunt is not required the ampere-hour recorder is low in cost and can be easily installed.

A companion piece of equipment is the new autoramic britener feeder which, when connected to an ampere-hour recorder, delivers measured quantities of briteners to plating solutions upon receiving a signal from the ampere-hour recorder.

E—541. Brite-All—Another new and most versatile product from the laboratory of Kosmos Electro-Finishing Research, Inc., is Brite-All (brightener for cyanide, zinc or cadmium plating). Small additions of this brightener improves the character of the deposit for both zinc and cadmium. Lustrous deposits are obtained even with contaminated baths. High current density burning is eliminated. Brite-All improves the throwing power of both zinc and cadmium finish. Brite-All is supplied as a concentrated viscous liquid diluted up to ten volumes and used for optimum finish. Brite-All does not affect the solderability of cadmium plate as similar products do. Brite-All is not toxic as used. It is shipped in non-returnable containers.

Hammond OF KALAMAZOO
GOOD MACHINERY SINCE '82

MODERN Self Contained GRINDER-POLISHER

Hammond Variable Speed (1500 to 3000 RPM) Polishing and Buffing Lathe. Models up to 50 HP available.

Hammond Cyclone Duskolector. One of a wide line of Cyclone and Filter Types.

Hammond Backstands. 10 Air and Spring Tension Models to choose from.

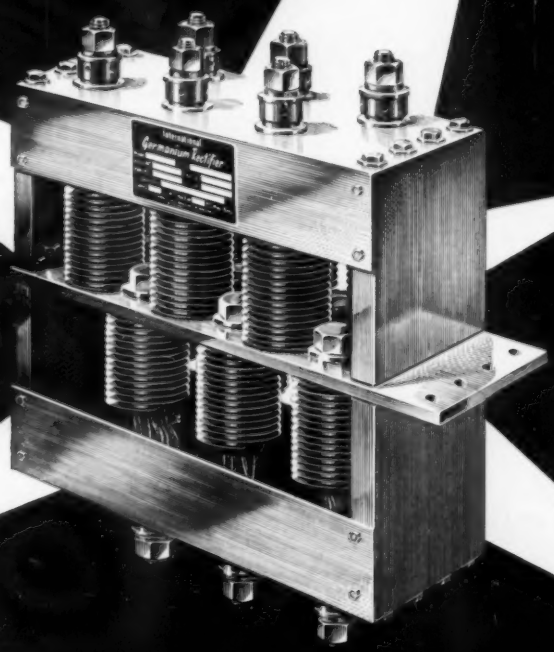
Write for Catalog No. 60 showing America's most modern and complete line.

Hammond Machinery Builders INC
1613 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

International Rectifier Corporation

proudly presents

International germanium power rectifiers!



This new line of
Power Rectifiers features:

- High efficiency ... up to 97%
- Lowest forward drop
- High reverse to forward ratio
- No reforming required after storage
- Unlimited life expectancy
- Ratings:
  26 to 66 AC input volts per junction
  150 to 100,000 amps DC output

Operating temperature range
−55 C to + 75 C

International Rectifier

CORPORATION

EXECUTIVE OFFICES: 1521 E. GRAND AVE., EL SEGUNDO, CALIFORNIA • PHONE OREGON 8-6281

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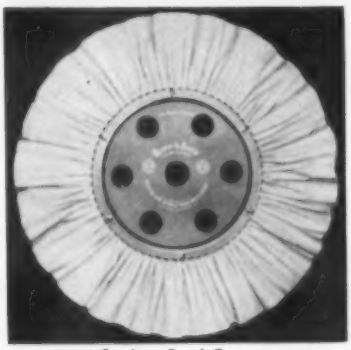
WORLD'S LARGEST SUPPLIER OF QUALITY INDUSTRIAL RECTIFIERS

EQUIPMENT & SUPPLIES



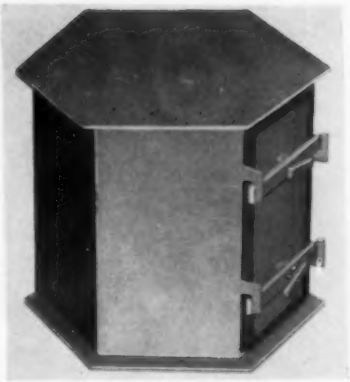
Cooling Steel Center

E—542. Center-Cooled Buffs—New steel centers on Hanson-Van Winkle-Munning Ruff-L-Buffs make the metal finishing wheels capable of dissipating frictional heat fast enough to keep the buff cool under all practical operating conditions.

The new center, composed of two steel discs, also provides stronger support for the buffs than the fiberboard centers formerly used. The central section of the buff is sewed together just past the steel area, providing an additional safety feature.

The discs used for the new center have steel clamps that are set deep in the cloth. The discs are multiple spot-welded together. Six ventilating holes assure a free circulation of air from the center of the buff to its periphery.

Due to the success of the new centers, all H-VW-M Ruff-L-Buffs will be manufactured with steel centers after March 1. The company reports that prices on all lines of Ruff-L-Buffs will remain the same.



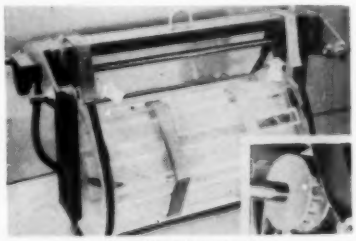
Interchangeable

E—543. "Build-Your-Own"—The Rampe line of replaceable, Precision Finishing Barrels, ranging in size from 1 gallon to 8 cu ft capacity, may be purchased individually for replacement with Rampe Equipment or for "Do-It-Yourself" shops, who wish to build their own tumbling machine. Turn table or flange mounting plates are also available.

The complete list of attachable barrels made is as follows:

1 gallon—Closed Hexagonal Barrel
1 gallon—Open Conical Barrel
5 gallon—Closed Hexagonal Barrel
7¼ gallon—Open Conical Barrel
1.1 cu ft—Closed Hexagonal Barrel
2 cu ft— " " "
4 cu ft— " " "
6 cu ft— " " "
8 cu ft— " " "

E—544. Cogged Belts—The Belt-Drive with the Gear-Grip, a unique and efficient principle of two Neoprene cogged-V-belts combined with two H-T Sincolite cogged drive-pulleys for positive transmission of power without metal gears and costly gear maintenance, is the latest Gill-Singleton Plating Barrel development, announced by The G. S. Equipment Co., Cleveland, O.



Gear-Belt Principal

Cogged-V-belts constant-meshed with matching cogs in H-T Sincolite drive pulleys can't slip, creep or vary speed, regardless of loads or other conditions. They deliver positive, mechanical-type transmission of power, eliminating cylinder-end drive gear, idler gear, pinion gear and their bearings. Ordinarily immersed in solutions, these parts are exposed to corrosive attack and are a constant expensive maintenance and replacement problem.

And you can put a lot of metal work through a cleaning tank charged with

Cowles NS SOAK CLEANER

because Cowles NS Soak Cleaner has *extra soil capacity.*

Cowles NS Soak Cleaner gives you *more emulsifying* action—*more power* to hold loosened soil in suspension long after ordinary soak cleaners have broken down.

No scum on the cleaning tank to foul cleaned metal coming out. Clean it with Cowles NS Soak Cleaner and it stays clean. Your tanks stay clean, too. No sludge build-up.

For tips on *soak tank* cleaning before plating, enameling, other finishing—

Send this coupon for NS Technical Bulletin

Cowles Chemical Company
7018 Euclid Avenue
Cleveland 3, Ohio
Please send Cowles NS Bulletin
Name_____
Company_____
Address_____
City_____ State_____

Cowles CHEMICAL COMPANY
Cleveland 3, Ohio

See Cowles' other advertisements on pages 592 and 612

Announcing

ROHCO®

SUPER XL

CADMIUM BRIGHTENER

The BEST One's Even BETTER!

ROHCO SUPER XL:

1. Gives the clearest and most uniform cadmium deposits yet seen.

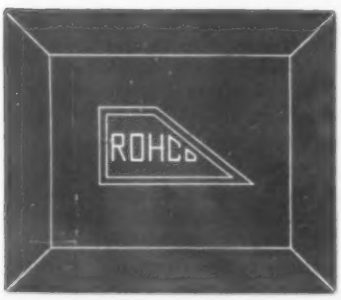
2. Has amazingly wide latitude of concentration range—for even more simple control.

3. Is supplied as either liquid or powder, as preferred, in highly concentrated form. You save on freight and container costs.

4. Changeover from ROHCO 20XL does not require company or government specification changes—no conversion problem.

Order From Your Nearest Distributor . . .

R. O. HULL & COMPANY, INC., 1302 Parsons Ct., Rocky River 16, Ohio



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"THE HULL CELL TEST MAKES PLATING BEST"

The abbot and the Million Shiny Buckles

The *abbot* studied the small watchband buckles. Each was stamped from stainless steel with nicely defined, square corners, evenly spaced decorative ridges and precisely placed pinion holes.

The little man's visitor wore a worried frown. "How," he asked, "can we put a good, shiny finish on a million of 'em, quickly and economically?"

In less than a week, the *abbot* mailed his meticulously typed reply. "Your watchband needs burnishing," he wrote. "Try barrel burnishing with Abbott 3/16" Diagonals. You'll find they are shaped to do the job right. Besides, the Abbott Method is fast, economical and thorough."

Abbott Burnishing Materials make efficient and uniform contact on metal parts and castings of every size and shape. Made from selected carbon steels, they are Deep Hardened with a glass-hard, mirror-like finish. Combined with the Abbott Vertical Barrel, they make the *perfect* barrel finishing combination.

Let the abbot show you how The Abbott Method can help you. Just drop a line to . . .

ABBOTT

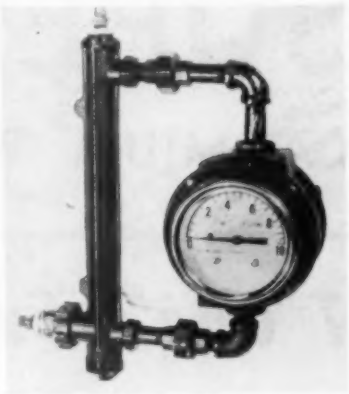
The ABBOTT BALL Company

1054 New Britain Avenue
Hartford 10, Conn.

INDICATE A 548.

EQUIPMENT & SUPPLIES

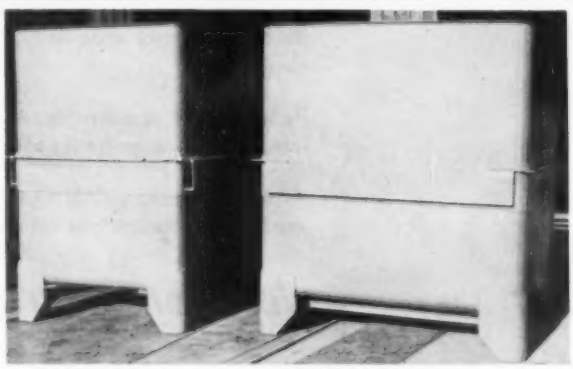
E—545. Vane-Type Flowmeter—An efficient simply designed vane-type flowmeter for air or gas flow, No. 1050, is now being offered by the Instrument Division of Scully-Jones and Company, Chicago manufacturer of precision holding tools. This flowmeter is designed for a constant pressure drop across the meter and may be used for indicating, controlling, signal alarm, safety shutoff, sequence starting or shutdown, and similar applications.



Multi-Purpose Meter

Operation of the instrument is extremely simple. As the vane rotates with increase in flow, the area between the end of the vane and the flexible spline in the meter body increases. This increase approximates the law of squares to provide pointer stability and an easy-to-read scale. By varying the weight of the vane, and the area, various capacities can be produced. The area is shaped to provide an evenly divided scale. Pointer movement on the dial is multiplied by gearing to produce a dial that is easily read at a distance.

E—546. Copper-Clad Laminates—Using a special bonding technique, International Resistance Co., Philadelphia, has succeeded in cladding a non-adherent polymer, fluorocarbon plastic, with copper. The resulting new laminate, in which no resin adhesive is used, features very low cold flow, zero water absorption, excellent machineability and a water-repellent surface. Also, it is unaffected by acids, alkalies, or common organic solvents. Fluorocarbon plastic is a thermoplastic material, and is inherently less rigid than thermosets—especially in thin sections. This copper-clad laminate is recommended for use under severe temperature, moisture, and electrical conditions.



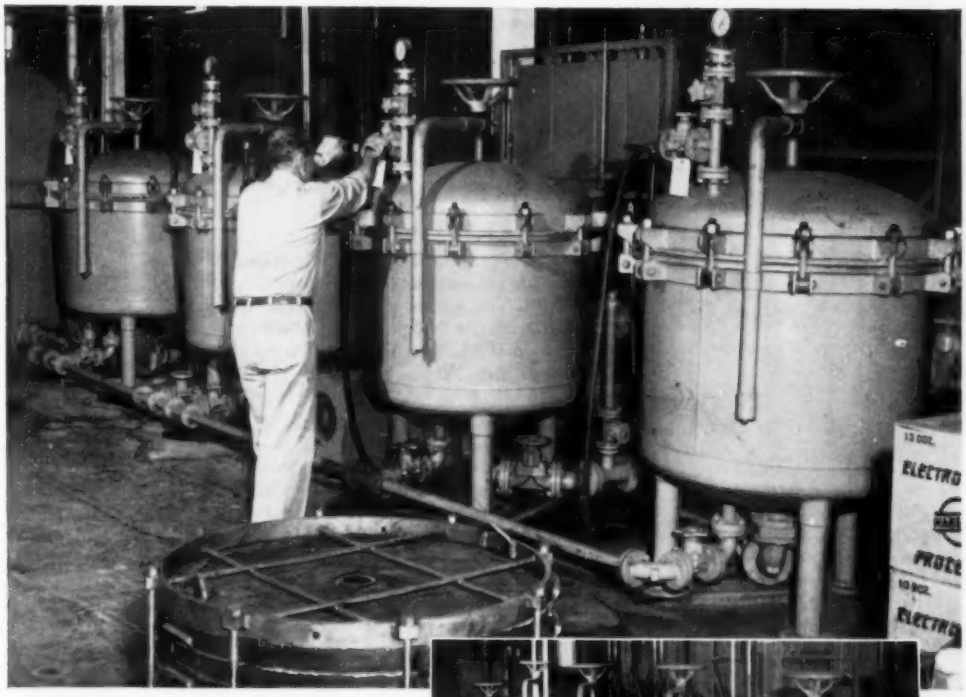
Stortswelding for Better Storage Units

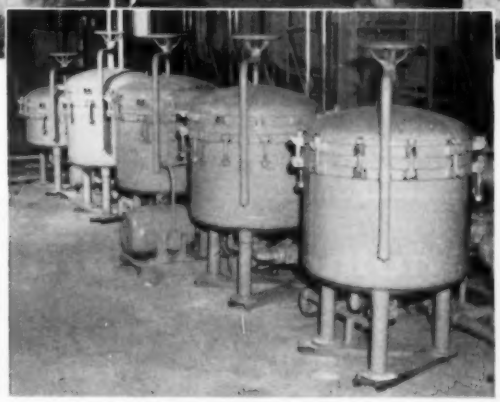
Make your storage and material handling equipment a lifetime investment. Let Storts do it. All Storts fabricating and welding procedures are designed to assure freedom from maintenance costs and service interruptions. Storts has built many thousands of tanks to different specifications, all of them welded to a single standard of high quality—guaranteed to satisfy.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 549.





High Flow Rates Low Servicing Cost *gives* Low Cost Filtering of Plating Solutions—

2,208,000 gals. of bright nickel solution are filtered in these four Sparkler Horizontal Plate filters (top illust.) through a continuous 5 day cycle with 24 hour operation. Filters are cleaned once a week by lifting out the plate cartridge and replacing it with a fresh dressed set of plates. Only a few minutes is required for this operation.

In the same plating plant, (lower illust.) the four large Sparkler filters are used to filter suspended matter from Ronal bright copper solution. These filters have a flow capacity of 4800 G.P.H. each. The small, far end unit filters suspended matter from a copper strike bath. Capacity 2,100 G.P.H.

On occasion these filters are employed for filtering out activated carbon and lime from copper solution and activated carbon and nickel carbonates from nickel solution.

Plating Plant Engineers will find Sparkler filtration engineers most co-operative to work with on installations of any size.
Write Eric Anderson

SPARKLER
horizontal plate
FILTERS
(the original horizontal plate filter)

SPARKLER MANUFACTURING CO. MUNDELEIN, ILL.
Sparkler International Ltd.
Manufacturing plants in Canada, Holland, Italy, and Australia.

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD.

EQUIPMENT & SUPPLIES

Easy Roller

E—547. One-Man Palletizing—A drum and barrel truck, which is said to make it possible for one operator to easily place heavy drums on pallets, has just been announced by Valley Craft Products, Inc., Lake City, Minn.

Designated Fzy-Rol Barrel Cart, the manufacturer states that the design of this cart allows the truck's shoes to be placed on edge of the pallet so that in one forward motion the drum can be elevated to the pallet with a minimum of operator effort. It is also said that drums can be safely lowered from pallets with this cart.

Another feature claimed for this cart is its spring operated chime hook which drops over the barrel edge as the truck is moved against the barrel without the operator touching either the hook or the barrel.

E—548. Impregnated—A new sectional impregnated abrasive buff, for the buffing of all ferrous and nonferrous metals, has been developed by the Coated Abrasives Division of The Carborundum Company, Niagara Falls, N. Y.

Selected from several designs after exhaustive tests, this new pleated type sectional abrasive buff will be of significant interest to all regular users of traditional non-impregnated buffs. Heretofore, the greatest cost element has been for abrasive cake and compound in stick or liquid form, applied to the buff—ranging from 12 to 24 times the cost of the non-impregnated buff itself. Carborundum's impregnated buff is a successful attack on this cost.

Engineered of specially-treated biased cloth, impregnated with selected abrasive grains bonded throughout its entire construction, the new sectional impregnated abrasive buffs are competitive to sisal buffs, in the finer grit sizes, for normal "cut-down" operations to prepare surfaces for color buffing or plating—or both. In the coarser grit sizes they are competitive to set-up wheels, coated abrasive belts, Tampico brushes and other polishing and buffing devices.

Really Loaded

E—549. Conversion Coating for Al_2—Development of a process that provides aluminum with a surface conversion coating for protection against corrosion, for improvement of paint adhesion and for ornamentation has been announced by Turco Products, Inc., Los Angeles manufacturer of specialized industrial chemical processing compounds. Called Turcoat 4178, the process meets Government Specification MIL-C-5541.

(*Continued on page 56*)

Another fine product made finer . . .

with the PARAMOUNT "Finishing Touch"

"In jewelry merchandising, fine finishes are all important in catching customers' eyes," reports Shields, Inc., world-famous manufacturer of fine men's jewelry. "We have found that Paramount Felt Wheels can economically produce finishes which meet our standards — *and the customers'*."

Take a tip from Shields, Inc., — make sure the finish on your product is *creating* sales . . . not losing them. Discover how Paramount Felt Wheels can give you better finishes, faster and at less cost. Call your supply house.

Paramount
Felt Wheels,
Bobs, Sheet Felt

Bacon Felt Co.
407 West Water St., Taunton, Mass.

It's my job..

to provide you with the best *electrolytic* and *soaker-type* compounds for your particular cleaning operation. May I tell you about - - -

•

APEX "ELECTRO 102" CLEANER

This formulation recommended for use in removal of soils from non-ferrous polished and unpolished parts, possessing high conductivity allowing any desired current density, without the use of excessive voltage. Excellent emulsification coupled with de-floculators for suspension of insoluable matter.

•

APEX "ELECTRO 101" CLEANER

Recommended for either direct or reverse electrolytic cleaning of ferrous metals at low concentrations. Long solution life, free rinsing, excellent chrome-tolerance and controlled pH.

•

APEX "761" CLEANER

Pre-soak cleaning of ferrous and non-ferrous parts for removal of heavily impacted soils such as buffing compounds. Moderately alkaline combination with powerful emulsifiers for quick penetration and free rinsing.

Ask one of our experienced technical field representatives to discuss the application of these or our other products to your particular operation —

. . . AND WATCH HIM GO TO WORK!

Apex **ALKALI PRODUCTS CO.**

A COMPLETE LINE OF CLEANING COMPOUNDS FOR THE PLATING INDUSTRY

MAIN AND RECTOR STREETS, PHILADELPHIA 27, PENNA., Phone, IVyridge 3-3939

SYRACUSE BOSTON DETROIT READING PITTSBURGH WEST HARTFORD

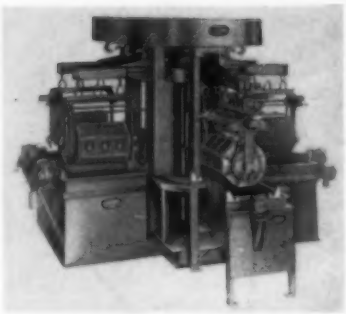
EQUIPMENT & SUPPLIES

Chief advantage of the new process over similar processes is said to be the "quick fix" offered only by the Turcoat material. The 4178 coating becomes fixed and non-smearing immediately upon application, whereas most other coatings will smear or streak if parts processed are handled or moved while still wet. Parts coated with Turcoat 4178 can be freely handled and racked while still wet. Drying is unnecessary. Bottlenecks in production lines are eliminated.

E—550. Two Systems—Two types of automated barrel finishing systems have been announced by ALMCO, Division of Queen Stove Works, Inc., Albert Lea, Minnesota.

These systems are now in use for micro-precision finishing of stamped, die cast, machined, extruded and centerless ground parts. The complete finishing process is automatic from beginning to end, controlled by one operator and pre-set switches. Finishing operations performed in this system can include: descaling, degreasing, grinding, deburring, burnishing, rinsing and rust inhibiting of metal parts.

The systems are the ALMCO Sub-O-Matic Skip-Station type and the ALMCO

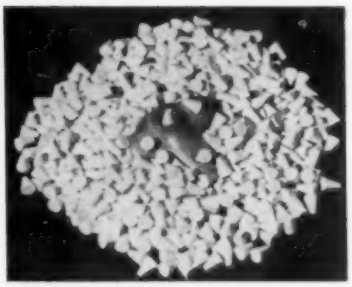


More Automation

Sub-O-Matic In-Line type of automated barrel finishing. The Skip-Station system can simultaneously finish a variety of parts requiring different finishes by automatic programming feature. The In-Line system is particularly suitable for finishing high production parts of different types requiring the same finishes and processes.

E—551. Clown's Hat Shapes—A new barrel finishing media—conical ceramic shapes—has been announced by Minnesota Mining and Manufacturing Co., St. Paul, Minn.

Called "Honite" brand Ceramicones, the new media makes it possible to barrel finish intricate parts which previously could not be finished in this manner because of lodging problems.



Lil Clown Caps

The tapered ends of the media permit access to holes for deburring, yet the broad bases prevent lodging; and the cones' resistance to wear enables them to maintain their original dimensions over a long period of time.

The media will also remove burrs and parting lines from molded plastic parts without scratching the fine surface produced in molding.

The cone-shaped media minimizes the dangers of contamination because the ceramic material is fused under high pressure to eliminate voids and resist deteriorating effects of acids.

E—552. Highly Permanent Ceramic Magnets—A low cost, ceramic permanent magnet material developed by the Stackpole Carbon Company, St. Marys, Pa.,

(*Continued on page 608*)

Here's the Polarizer YOU asked us for!

Low cost — completely portable, yet it does everything you need!

Two years ago we brought out polarizers for electro-platers to use in making rapid, accurate analyses of their plating solutions. As we told you at the time . . .

The C-1 Gave You FULLY ADVANCED Research-Control . . . because we developed it out of our own long experience as contract and production platers, and because test models had been very well received by large plating concerns.

But You Told Us It Gave You Far MORE Than You Needed When we talked to you—the plating men on the firing line—you told us you didn't need expensive additional research features. You needed a small, self-contained instrument to tell you the exact metallic content of your plating solutions.

So Here's the Patwin C-2—Just What YOU Asked For! In two steps you get the answer: take the current reading on the microammeter; read the analysis on the scale in the Patwin "Cook-Book" Manual. It takes only a couple of minutes; there are no complications.

No Connections Needed! It's Entirely Self-Contained! This new Patwin C-2 Polarizer doesn't have to be plugged in! It runs on three 1½-volt Burgess batteries. Its range is: 0-10-20-30-50-100 microamperes full scale. The sensitivity on direct reading is .1 microampere. Case is 14" x 8" x 8", and is finished in gray hammertone finish on steel—bonderized and primed. For full details, send in the coupon today!

The Patent Button Company **Waterbury 20, Conn.**

PATWIN INSTRUMENTS Division
THE PATENT BUTTON COMPANY, WATERBURY 20, CONNECTICUT
Please send me full information on your new Patwin C-2 Portable Polarizer.

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MICCRO COATINGS
Make Tough Jobs EASY!

MICCROSOL E-1003 — Today's outstanding heat-cured rack coating. Meets industry's highest standards for corrosion and abrasion resistance.

MICCROSTOP — For extreme accuracy in masking parts for all plating cycles.

MICCROMASK — Provides complete masking protection for hard chromium plating.

MICCROPEEL — A special lacquer that can be peeled easily from parts after all plating cycles.

MICCROWAX — Two waxes widely used for selective stop-off. C-562 for hard chromium; C-600 for high temperature cycles.

MICCROTEX — An air-dry rack coating for all plating cycles. Excellent for patching and repairing.

MICCROTAPE — An extruded tape which provides unexcelled protection for plating racks, and for masking parts prior to selective plating.

MICCROTUBE — Extruded tubing especially suited for use on contact wires, and for selective plating of simple parts.

MICCROLOID — Corrosion-resistant industrial maintenance paint.

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Developed and manufactured by experienced platers

MICCRO Products

MICHIGAN CHROME *and Chemical Company*

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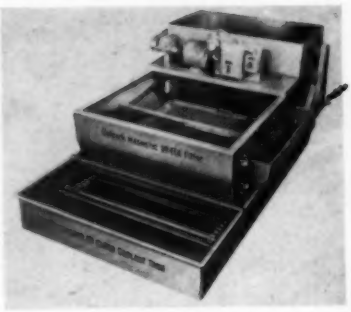
combines adequate energy product with high coercive force, low residual induction, virtually 100 per cent electrical resistivity and exceptional resistance to demagnetization. These unique characteristics plus low cost and the non-critical nature of the ceramic make magnets of this material well fitted for all ordinary permanent magnet uses as well as others of a more exacting nature, such as those where the magnets may be exposed to strong demagnetizing fields.

Made of non-critical, inexpensive barium and iron oxides, the new Stackpole permanent magnets are classified among the hard magnetic materials. They cost materially less than metallic magnets. Also, they weigh less—only 4.85 gms/cm³.

E—553. Up-Flo Separator Filter—The Delpark Up-Flo Filter with permanent, bar stock bronze screen has been redesigned to include the added features of magnetic separation. Delpark's new method of magnetic separation makes use of a flat magnetic field on to which the liquids are diffused. This new principle of design uses the force of gravity to assist the magnetic field. Contrary to Delpark's design, conventional magnetic separators must overcome the force of gravity to separate the ferrous particles from the liquids.

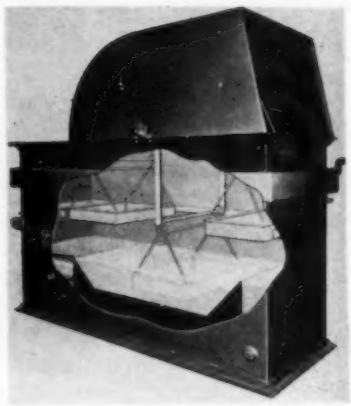


Gravity plus Magnetism

The efficiency of the extremely powerful magnetic field is even further increased. This large, most powerful magnetic area of No. 5 Alnico magnets gives twice the width of field and permits lower flow velocity which prevents washing and turbidity.

E—554. Degreaser & Cool Dip—A new type vapor degreaser has been announced by Phillips Manufacturing Co., Chicago, Ill. The unit operates on Phillips' rotomatic principle which permits a predetermined and accurately controlled degreasing time-cycle. However, instead of simply a vapor degreasing operation, a cool dip rinse has been incorporated to wash off chips and other insolubles.

The dip cycle operates in two ways.

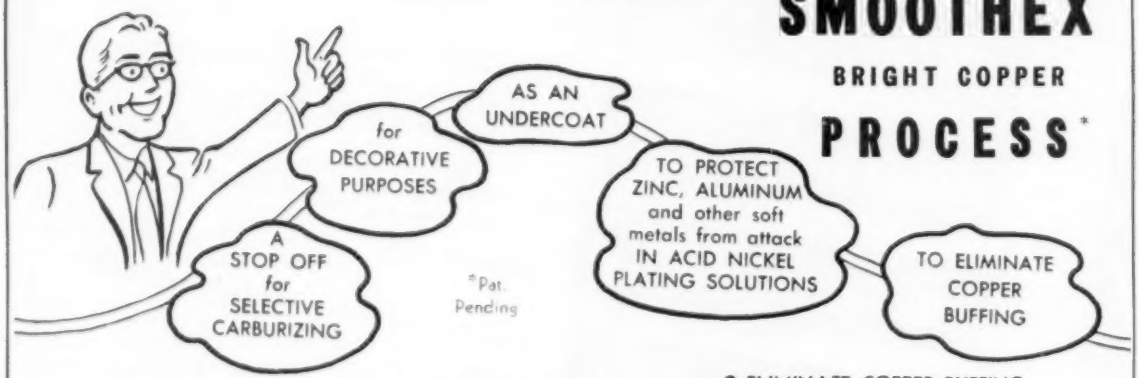


Real Cool Degreaser

The liquid solvent rinse gets back into blind holes and recesses in the work being degreased. In addition the work is cooled so that in each complete cycle of baskets or tumblers (either available) there are two separate condensing vapor stages. The result is a very complete degreasing cycle which may be repeated, if needed, to remove more stubborn soil than is usually encountered.

E—555. Chrome Plater—A new, large capacity chrome plating unit especially designed to plate large size metal forming and plastic molding dies as well as en-

You'll Plate Parts Faster AT LOWER COST
when You USE The
SMOOTHEX
BRIGHT COPPER
PROCESS*


AS AN UNDERCOAT
for DECORATIVE PURPOSES
TO PROTECT ZINC, ALUMINUM and other soft metals from attack IN ACID NICKEL PLATING SOLUTIONS
TO ELIMINATE COPPER BUFFING
A STOP OFF for SELECTIVE CARBURIZING
*Pat. Pending

End your plating solution troubles, now! Switch to the amazing new SMOOTHEX BRIGHT COPPER PROCESS for greater brilliance, speed and top quality, lower cost runs. Your present equipment can quickly and easily be adapted to the Smoothex Process. Send a sample of your plating solution to us, at once, for conversion information.

- ELIMINATE COPPER BUFFING
- SAVE NICKEL
- EASE OF CONTROL
- GET INSTANT SPECULAR BRIGHTNESS
- ENJOY LOWER MAINTENANCE COST
- LOWER OPERATING COST
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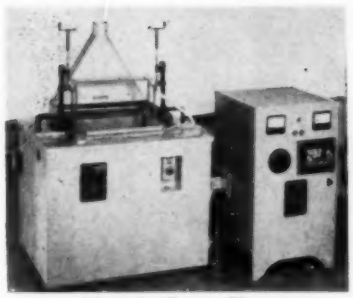

Versatile Chrome Plater

graving plates, heavy shafts, etc., has just been announced by the Dawson Corp.

Known as the Chromeplater model 300 this unit has a plating tank 15 in x 20 in x 30 in deep. It is equipped with two 3000 watt electric immersion heaters and a heavy gauge steel water jacket which provide accurate control of the plating bath through an adjustable thermostatic temperature control.

A special feature is the Plastisol covered steel work platform with bus bar supports and acme thread height adjustment for maximum plating efficiency.

The fully equipped rectifier, which provides a 300 amp d-c output to the plating bath, operates on a standard 200-v, 3-phase, 60 cycle ac service connection.

E—556. Pourer—The Tripl-Duty Truk-Boy offers a safer way to transport and pour. The Safety ratchet on the tilter has fingertip control for positive operation. The air vent pouring spout assures a splash-free flow; with a capacity of 3 to 5 gallons per minute.

Carboy Tipper

The truck offers placement in the carboy tilter. Locking device permits tilter to be held in a rigid position for loading, so the whole operation can be done by one man. Fitted with a base plate. May also be used to transport stainless steel containers and load them into the tilter.

E—557. Anti-Rust Spray—A rust preventive spray for use on tools, molds, dies, instruments, nested metal parts and machinery is in production at Eastern Aerosol Products, Newfoundland, N. J. Distributors and dealers are being appointed in all sections of the country and for export markets.

Anti-Rust

Known as "Rust Chek," the new compound is packaged in a 12-ounce aerosol spray container. According to Eastern Aerosol management, a can provides approximately 80 square feet of coverage in the form of a clear, dry, waxy film to a thickness of 0.0005. The metal strip which appears in the photo has been subjected to hundreds of humidity and salt-water exposures.

L—558. Shop Hints on Barrel Finishing—A brief handy shopman's guide removes mystery from barrel finishing—outlines six basic essential operating conditions as size and type of abrasive stone or burnishing balls, load height, speed of rotation, amount of water, ratio of work parts to burnishing balls, and time. Also on this sheet are listed new barrel finishing compounds.

Literature by Rampe Manufacturing Co., gives a chart of uses for each compound, quantity usage and prices in various standard containers.

GRIND
POLISH
BUFF
DEBURR
with a Hammond
ROTARY AUTOMATIC

SEND SAMPLES
and we'll show you how much you can speed production and cut costs.

Model "K" Hammond Automatic Finishing Machines are made in 34", 46" and 62" table sizes. These models are either continuous or for indexing at 150 to 1700 indexes per hour. Head styles include floating, non-floating with 3 H.P. to 20 H.P. range. Also available are attachments for converting heads from buffing to abrasive belt polishing. The Hammond Model "K" will speed up your grinding, polishing, buffing, brushing and de-burring operations. Send us samples and learn how much you can speed them up.

Hammond Machinery Builders INC
1613 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

how to make paint stick *to non-ferrous metals*

Successful application of paint to non-ferrous metals, depends on more than cleanliness prior to painting and the quality of organic films used.

Many non-ferrous metals are highly reactive with the paint films used to protect or enhance them, especially in the presence of moisture. Metallic soaps are readily formed and in their formation destroy the protective film.

KENVERT CHROME SEALER films have been developed to stop this activity and eliminate this type of difficulty. These KENVERT finishes are available to brighten as well as protect zinc, cadmium, copper and brass. Finishes are also available that offer excellent protection, with no brightening to the above metals and aluminum. All finishes are produced in simple, short, dipping operations—requiring no expensive equipment or racking.

Send us detailed information on your requirements. Our laboratory is ready to consult with you or treat samples at no obligation.

CONVERSION CHEMICAL CORPORATION

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BOOKS

Largest **Book of Standards** in its history published by American Society For Testing Materials.

The American Society for Testing Materials has completed and published its largest triennial Book of ASTM Standards. The 1955 edition has over 11,000 pages and includes more than 2,150 standard specifications, tests, and definitions for materials. This important technical book is an excellent example of the valuable results which come from the intensive work of the Society's many members and active technical committees. ASTM standards are used not only by American industry and on the North American continent, but by many industries and governments throughout the world. The Book is issued in seven parts, each pertaining to a particular area or group of areas of materials. The Book of ASTM Standards is published on bible-type paper (to conserve shelf space and weight) with blue cloth covers and red backstrap. The seven parts are made up and priced as follows:

	No. of Standards	No. of Pages	Price	AES Members
Part 1—Ferrous Metals	315	1834	13.50	12.15
Part 2—Non-Ferrous Metals	270	1516	11.00	9.90
Part 3—Cement, Concrete, Ceramics, Thermal Insulation, Road Materials, Waterproofing and Soils	477	2062	13.50	12.15
Part 4—Paint, Naval Stores, Wood Cellulose, Wax Polishes, Sandwich Building Constructions	323	1416	11.00	9.90
Part 5—Fuels, Petroleum, Aromatic Hydrocarbons, and Engine Antifreezes	242	1496	11.00	9.90
Part 6—Electrical Insulation, Electronic Materials, Plastics and Rubber	300	1776	13.00	11.70
Part 7—Textiles, Soap, Water, Paper, Adhesives, and Shipping Containers	354	1692	11.00	9.90
Complete Set—Seven Parts			84.00	75.60

(Standards of a general nature appear in several parts.)

Each Part is complete with a detailed subject index and a list of standards in numeric sequence. The 1955 Book of ASTM Standards, containing 2,153 standards as compared to the 1,898 standards in the 1952 edition, is about 13 per cent larger than the 1952 edition. Since 1952, 1,158 standards are new or revised.

To keep the Book up to date, supplements will be issued to each part late in 1956 and late in 1957. As a service, a complete Index is furnished without charge with each set of the Book of ASTM Standards.

Elevated Temperature Properties of Carbon Steels (ASTM Special Technical Publication No. 180) 68 pages, $3.75; AES members, $3.40.

This is the fourth publication in a current series prepared under the auspices of the ASTM-ASME Joint Committee on the Effect of Temperature on the Elevated Temperature Properties of Metals. This series was started so as to incorporate in one book the available elevated temperature data on a particular "family" of metals.

Electrons, Atoms, Metals and Alloys by William Hume-Rothery. 387 pages, $10.00; AES members, $8.50.

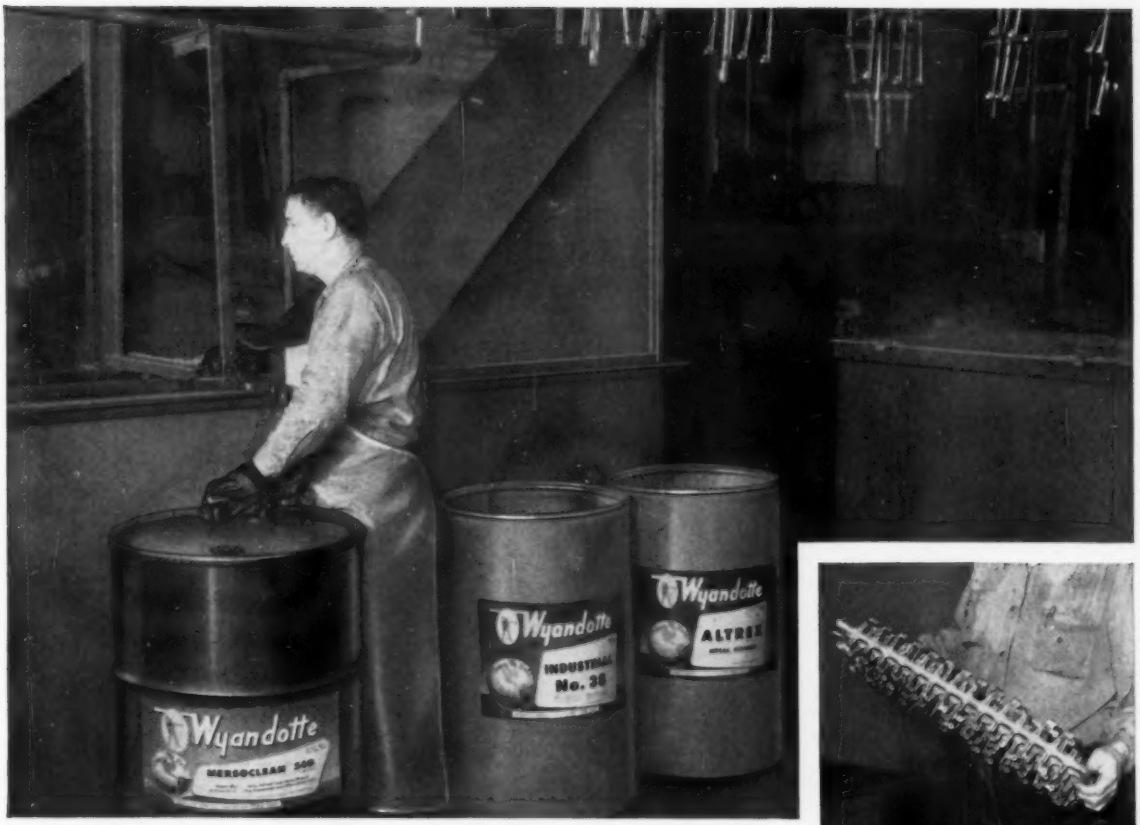
An introduction to atomic theory with special reference to metals and alloys. 1948 edition has been revised, in 1955, and retains the dialogue form between an Older Metallurgist and a Younger Metallurgist. This device brings out clearly the contrast between the old and new viewpoints.

Modern Chemical Processes—Vol. IV by the editors of "Industrial and Engineering Chemistry." 230 pages, $5.00; AES members, $4.25.

Each of the published volumes contains a significant collection of articles that deal with many modern chemical processes operated on a full-scale production level, and which have never before been so completely described. The practicing industrial chemist, the chemical engineer and the advanced student in these fields will find these volumes, as well as future volumes to be issued every two years, a reference work of the very latest and most modern production methods in the chemical and process industries.

Electronics by A. W. Keen. 256 pages, 190 diagrams, 50 plus photographs, [$7.50; AES members, $5.40.

Here is a serious attempt to present an up-to-date and comprehensive account of electronic devices and their applications. It is designed specifically for the non-technical reader.



Here, workman prepares MERSOCLEAN 540 pre-soak for zinc die castings and other metals. After soaking in MERSOCLEAN 540, parts are spray-washed with a Wyandotte alkaline cleaner.

Academy Plating removes stubborn buffing compounds with new Mersoclean 540 process

The Academy Plating Co. of Newark, New Jersey, was looking for an economical, yet more effective way to remove impacted buffing compounds from brass and steel—and from zinc die castings, which they manufacture and finish. Although trying to cut costs, they also wanted to lower the number of rejects caused by inadequate cleaning prior to plating.

That's where Wyandotte's *brand-new* MERSOCLEAN 540 and companion products entered the picture and solved Academy's problems. The safe, nontoxic, highly effective MERSOCLEAN 540 process eliminated expensive degreasing solvents; buffing compounds were completely removed, even in deep crevices. The result: fewer rejects, less labor, and increased production.

For complete facts on MERSOCLEAN 540—and other Wyandotte metal-cleaning products—contact our nearest representative.

Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.

Wyandotte
CHEMICALS
J. B. FORD DIVISION

SPECIALISTS IN
METAL-CLEANING PRODUCTS

BOOKS

Fatigue of Metals by R. Cazaud (translated by A. J. Fenner), 334 pages, $12.50; AES members, $10.65.

Dr. Cazaud is well known and highly esteemed in research circles; he is regarded, not only in France but throughout the industrial world, as a leading authority on the fatigue of metals. This work is profusely illustrated, well documented and carefully annotated. It covers metal fatigue from characteristics through testing, limits, fatigue factors, fatigue strength of structural joints, etc.

1956 Finishing Handbook and Directory: edited by I. S. Hallows. 489 pp., $5.50 plus $1.00 postage (including twelve monthly issues of "Product Finishing", London); AES members, $4.65 plus $1.00 postage.

The sixth edition of this handbook and directory for finishing methods and materials has undergone a number of changes. These include the addition of the following sections on finishing materials to the handbook which now extends to 298 pages:

Cures for Faults in Electroplating Baths; including: cyanide brass; cadmium; hard chromium; copper; silver; acid zinc; cyanide zinc.

Treatment of Electroplating Wastes; including: source and composition; effects on streams; effects on sewage treatment; general treatment methods; individual waste treatments; analytical control.

Chief Finishing Specifications.

Books on Finishing Subjects.

In addition, the sections on paint testing methods, on electroplating plant and on electroplating processes have been extensively revised.

The directory of equipment, plant and materials used in the finishing field, of outworking firms and of trade and brand names, which extends to 188 pages, has been completely revised, a process which is felt to be justified by its value in providing much trade information not available from any other source. A thumb index system is included for rapid reference to the main directory sections.

An Introduction to the Electronic Theory of Valency—3rd Edition. J. C. Speakman, 176 pages, $2.50; AES.

Twenty years have elapsed since the first version of this book was written. Parts of it were extensively modified in 1943. This new edition has therefore been divided into two unequal parts. The first gives the elementary rules for drawing electronic formulae. But, when we come to apply such idealized formulae to actual chemical substances, then the effects of these developments become very important; they have greatly extended our understanding of the formulae themselves, and at the same time rendered their application less simple than might have appeared in 1927. The larger part of the book—now constituting Part 2—has been rewritten accordingly.

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25 Years Ago

In May 1931 the MONTHLY REVIEW carried an Editorial in which there was a review of the past, present and future. The Editorial began with:

"The first issue of the MONTHLY REVIEW was published in June, 1913. Samuel R. Taylor was the editor. The first year's numbers contained 54 pages and were only published quarterly, but since that time the REVIEW has been printed regularly every month. The following editors have served: H. E. Wilmore, 1914-1915; J. H. Hansjosten, 1915-1916; H. J. Richards, 1916-1917; H. H. Williams, 1917–1921; W. J. Allen, 1921-1922; F. C. Mesle, 1922-1926; F. J. Hanlon, 1926–1930.

George Hogaboom wrote an article on "Anode Rods." A paper presented at the Annual Educational Session of the New York Branch on February 11, 1931, entitled, "Throwing Power of Sulfate Zinc Baths," by L. C. Pan was carried. E. Lamoureux concerned himself with an article entitled, "What Constitutes a Good Base For A Standard Electroplate," from a paper read at the Los Angeles Branch Annual Educational Session. G. Soderberg's paper, which he had read at the Chicago Annual Meeting in January 1931, called "Rust and Rust Prevention," came next.

There were the usual convention news, AES page and President's letter, together with 16 pages (digest size) of Branch News. It was a 60-page issue which speaks loudly of the technical excellence and the interest of the AES members during the depression.

10 Years Ago

By May of 1946 the MONTHLY REVIEW had grown into a respectable little book of 114 pages with a violent violet cover and other color on assorted pages throughout. It carried the programs of the 33rd Annual Convention to be held the following June at the Wm. Penn Hotel at Pittsburgh, Pa.

V. Mattacotti of the Milwaukee Plating Company, authored an article as a part of a symposium on nickel plating entitled, "Cold Nickel Plating and Soft Deposits." Wm. Phillips wrote on "Watts Type Nickel Baths." M. Diggin wrote on "Alloy Type Nickel Baths." B. Martin wrote on "Organic Type Bright Nickel Baths." W. A. Wesley on "All Chloride Nickel Baths." W. C. Pinner on "High Speed Nickel Baths," and all of these were followed by a general discussion.

The precocious Myron Diggin has still another article on "Purification of Electroplating Solutions." This issue carried five pages of Branch News, ten pages of AES News and was in general a well balanced issue.

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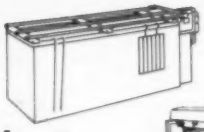

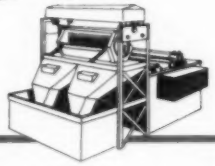

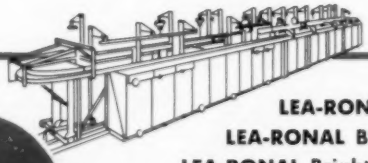

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IRON* PLATING

By JOHN G. BEACH†

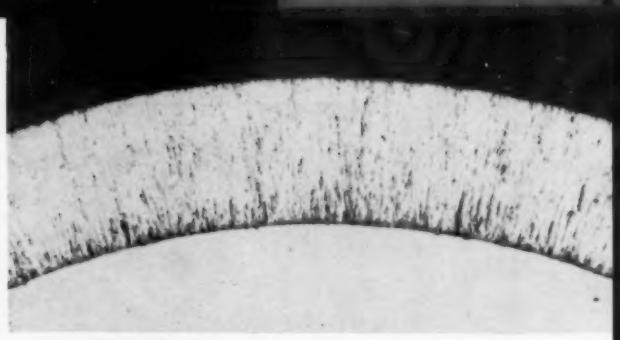

Figure 1. Iron on Brass—As Deposited

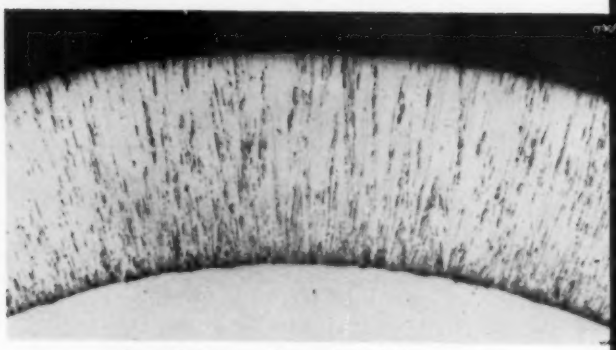

Figure 2. Iron on Brass—Annealed

Although electroplating or iron has not yet reached the prominence of other metals in the plating world, currently there is considerable interest in iron plating to answer engineering needs and to supplement copper, nickel, and chromium plating.

ADVANTAGES OF IRON PLATING

Electrodeposited iron has a number of factors in its favor:

(1) Iron is low in cost and is abundant.
(2) Iron dissolves well as an anode.
(3) Iron can be electrodeposited with selected properties:
  (a) Hardness: 127 to 360 Brinell
  (b) Tensile strength: 56,000 to 113,000 psi
  (c) Annealed: 90 Brinell; 40,000 psi
(4) Electroplated iron can be easily plated over or fabricated.
(5) Electrodeposited iron is more corrosion resistant than cast iron or some steels.
(6) Electrolytic iron has about twice the heat conductivity of cast iron or steel.
(7) Nickel on electroplated iron had less intrinsic porosity than nickel on steel.[1]

An iron-plating process was needed for some electrocladding applications in which several process requirements had to be met: (1) ease of operation, (2) reproducibility of thick, sound, pit-free deposits, (3) iron deposits stable when heated to annealing temperatures, and (4) a bath that would not chemically attack the basis metal being electroclad.

The electrodeposition of iron, up to about 1952, was reviewed by Thomas and Lamb.[2] Ductile iron plating from ferrous chloride solutions containing manganese chloride at 160 to 220 F was discussed by Stoddard.[3] A sulfate-chloride iron electrotyping bath was discussed by Schaffert and Gonser.[4] In 1920, MacFadyen[5] reported studies carried out with ferrous ammonium sulfate baths.

None of the processes reported in the literature fulfilled all requirements. Chemical attack of such metals as aluminum, beryllium, thorium, uranium, and zinc occurred in some baths, and sporadic pitting of the deposited iron was encountered with others. Thus, before iron plating on these unusual metals could be properly evaluated, an improved iron plating process was needed. This paper describes a new iron plating bath that met the above requirements.

Two nickel-plating baths, one patented by E. M. Baker[6] in 1938 and another reported by H. K. Work [7] in 1928 for plating nickel on aluminum, had been used successfully to answer similar requirements for nickel plating. Iron-plating baths based on the formulations of these two nickel baths were investigated. The Baker type of formulation with sodium-formate, seemed the more likely to lead to an iron-plating bath with the desired operating characteristics.

PLATING BATH AND OPERATING DETAILS

Preliminary work led to the following iron-plating bath formulation:

	g/l	*oz/gal*
$FeSO_4 \cdot 7H_2O$	300	40
$FeCl_2 \cdot 4H_2O$	42	5.6
H_3BO_3	30	4
NaCOOH (sodium formate)	15	2
$(NH_4)_2SO_4$	15	2
Sodium lauryl sulfate‡	1	0.1
Bath *p*H	4.0 to 4.2	
Temperature	140 F	
Current Density	30 to 40 amp/ft²	
Plating Rate	1200 amp-min/ft² = 1 mil	
Anodes	Armco or Globe iron	

Ammonium sulfate in the bath helped overcome high-current-density edge cracking. Sodium formate did not

* Work done under AEC Contract No. W-7405-eng-92.
† Battelle Memorial Institute
‡ Duponol ME (dry) was satisfactory.

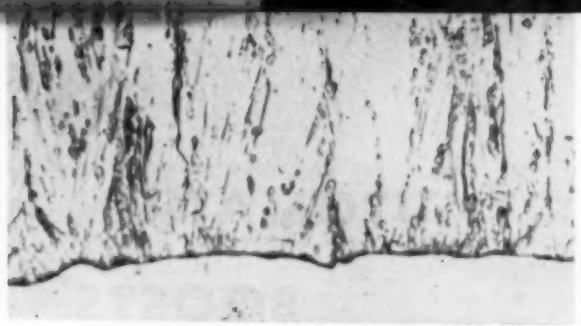

Figure 3. Iron on Brass—As Deposited

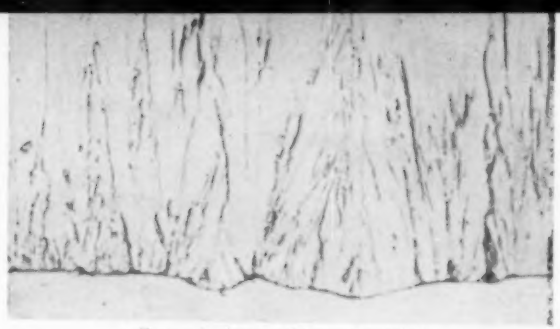

Figure 4. Iron on Brass—Annealed

lower the cathode current efficiency or increase the cathode gassing in this bath as was reported[2] for formic acid in hot ferrous chloride baths. Oxidation of the iron to the ferric state and precipitation of ferric hydroxide in the bath occurred slowly at the operating *p*H of 4.1 to 4.2. The presence of ferric hydroxide in the bath, however, did not adversely affect the electrodeposited metal. At a lower *p*H, the precipitation was lessened somewhat, but the current density range for sound iron deposits was narrowed.

Operating temperature of 140 F was found best, but sound deposits were obtained in baths within the temperature range of 120 to 160 F.

Current densities of 30 to 40 amp/ft² are recommended. Brass Hull-cell panels (4 x 2 in) plated for 7½ minutes with 4.5 amperes/panel showed only slight burning on the high-current-density edge. The current-density range over the test panel was calculated[8] to be from 10 amp/ft² to 150 amp/ft².

Anodes of Armco iron were used. The carbon in the iron formed a pseudo anode bag that aided uniform anode dissolution.

Simple cathode bar agitation was satisfactory. Continuous filtration of the bath was generally done, but the only advantage of filtration appeared to be clarity of the bath.

The preparation of a basis metal for iron plating is by methods known for the specific metal being coated. The iron deposit is similar to a Watts nickel plate in texture and appearance.

Photomicrographs of iron on brass are shown in Figures 1 through 4. Figures 1 and 3 show the grain structure of as-deposited iron at 75X and 1000X. Another section of the sample was heated for about 1 hour at 932 F. Figures 2 and 4 show the structure of the iron after heat treating.

Photomicrographs of a section of an electroformed iron shell are shown in Figures 5 and 6, at 250X. The aluminum mandrel had been removed from the 50-mil-thick iron shell by dissolving in a hot caustic solution. The as-electroformed structure of the iron, shown in Figure 5, was modified by grain growth that occurred during heating for a few minutes at about 1200 F as shown in Figure 6.

Figure 5. Iron Electroform—As Deposited

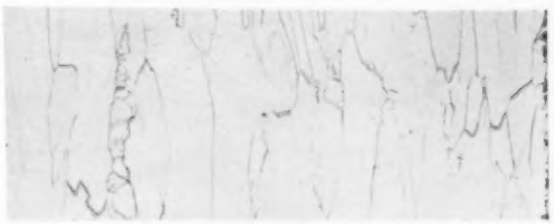

Figure 6. Iron Electroform—Annealed

CONCLUSIONS

More iron plating will probably be required of platers. It is hoped that these data will help the plater add electroplated iron to his useful processes.

This iron-plating process was not developed to the extent of commercial operation, but pilot plant baths up to 12-gallon capacity have been operated successfully and rack loads with areas of 1 ft² have been processed. Iron plated directly on aluminum, beryllium[9], brass, copper, niobium[10], thorium, uranium, and zinc was satisfactory for the research needs of reproducible sound iron plates.

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John G. Beach is a Principal Electrochemical Engineer with 16 years of experience in metal-coating fields; 3 years of experience in raw material and production control for paints and varnishes and 13 years of experience in electrochemical engineering research. He is a registered professional engineer in the State of Ohio. For the past 7 years, he has conducted studies on electrocladding and electrodeposition of the unusual metals.

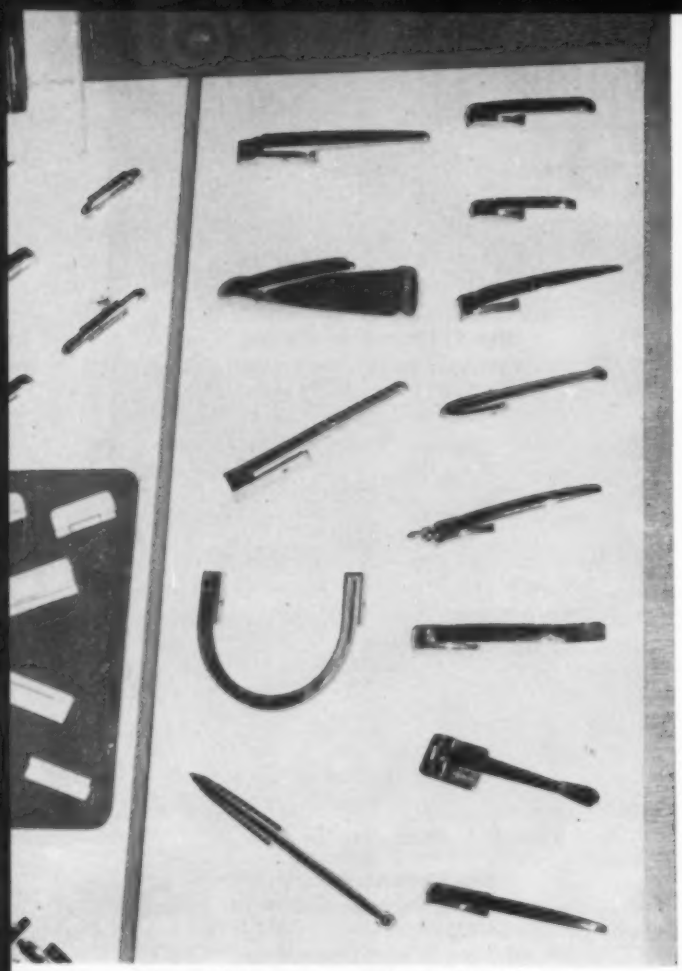


Fig. 2. Plating parts on display. National Lock plates over 2,500 different parts at its plant. Most consist of die-cast refrigeration hardware, of which the company is the world's leading manufacturer

AUTOMATION BOOSTS PLATING CAPACITY

By Leonard B. Weeg†

A new giant $300,000 automatic installation for copper, nickel & chrome plating hardware products was recently set in operation at the National Lock Co., Rockford, Ill.

Engineering features of the installation[1], include automatic conveying, automatic loading and unloading, automatic bypassing, automatic stripping, and a safety device that enables an operator to bring moving equipment to a halt from any place on the plating machine. The plating machine, referred to by personnel in the plant as "Big Bertha," covers an area of 3,000 square feet.

† Superintendent of Finishing Division National Lock Co.

[1] The plating conveyor for this installation was built by Hanson-Van Winkle-Munning Co., Matawan, N.J.

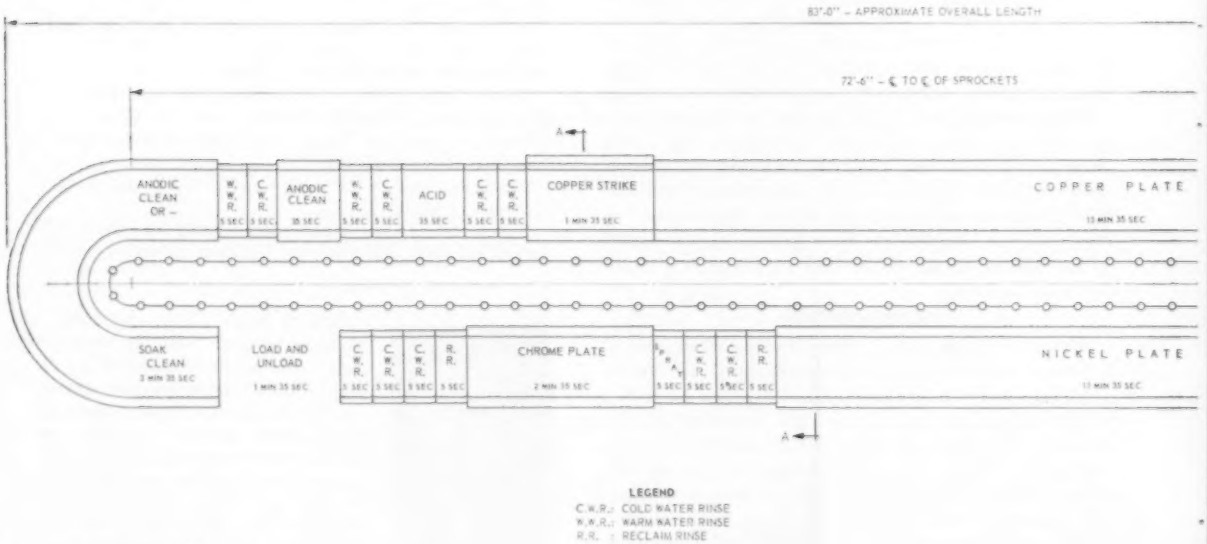


Fig. 1. Drawing of H-VM-M full automatic conveyor

Parts of varied design and size are plated on the new machine. Most parts consist of zinc alloy die-cast refrigerator hardware products, of which the company is the world's leading manufacturer. Others include cabinet and range hardware, and various types of furniture trim.

Refrigerator parts, particularly in recent years, have become much larger—to such an extent that plating tanks were having difficulty handling the larger sizes.

Some parts are made of sheet steel. Some of these must be painted as well as plated. Other parts require only copper plating—sheet steel range handles, for example. Still others require a satin chrome finish which necessitates brushing after copper and nickel plating.

HOW PRODUCTION WAS BOOSTED

1. **Automatic Conveying:** The copper, nickel and chromium plating operations are carried out automatically. The full-automatic return-type machine can perform all three plating operations in sequence, any two of the three, or simply any one of the three. With this conveyor, plating cycles and immersion times may be simply and easily varied and controlled. Changes, for example, are made several times in a typical day.

Do frequent changeovers slow down production? Not if they can be made rapidly. The new machine has increased plating capacity up to 150 per cent, and is turning out between 7,000 and 20,000 plated parts per 8-hour shift.

2. **Automatic Loading and Unloading:** Automatic transfer mechanisms load and unload racks on the plating conveyor. One operator would normally be required to perform the same operation, which means a saving of several thousand dollars annually.

The loading and unloading mechanisms, which are similar in design, are located alongside each other between the end of the chromium plating line and the beginning of the copper plating cycle. Actuated by chain drives, they move reciprocally between the plating machine and an auxiliary conveyor.

They are synchronized to load and unload racks while the carrier arms of the plating conveyor are in a dwell or down position. Speeds of the two conveyors are so regulated, and loading and unloading so sequenced, that a rack is delivered to the plating conveyor and one taken from the same machine every 38 seconds during the normal cycle.

3. **Automatic Bypassing:** With the elevator-type plating conveyor, cathodic cleaning, anodic cleaning, the copper strike, copper plating and the acid dip, nickel plating and chromium plating operations are set up for bypassing.

Bypassing is accomplished when individual carrier arms stay aloft over the "bypass" tank, and continue their forward movement around the conveyor in the usual manner. Actuating the bypassing movement is a flipper mechanism located at the bypass tank. Manually positioned, it contacts a roller on the carrier arm. The arm then stays aloft during the normal lowering cycle.

4. **Automatic Stripping:** The plating of copper-nickel-chromium is done without reracking. Frequently work is reracked after nickel plating in order that racks used for copper and nickel plating might not be used for chromium plating, and vice versa. Reason: small quantities of chromium plated-out near the contact points of the rack can contaminate the copper and nickel solutions.

The problem of possible contamination has been overcome by electrolytically stripping the racks of chromium

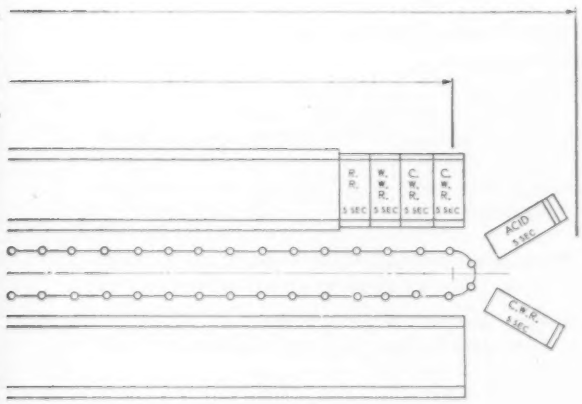
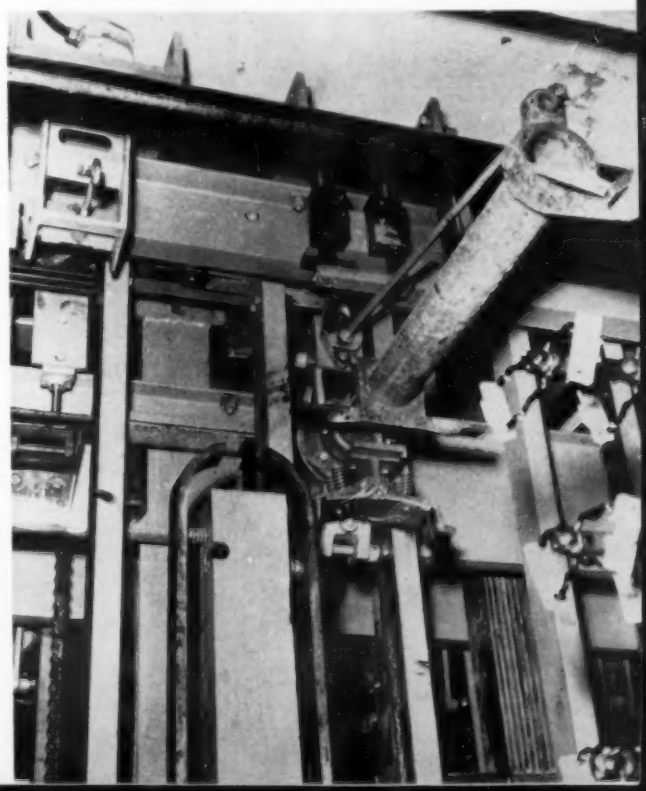


Fig. 3. Current-on immersion is provided by these cathode rails that are mounted on supports from the framework of the plating conveyor. Collector fingers of the individual carrier arms are shown engaging the rail as it descends into the plating bath. Current-on immersion produces better adhering coating



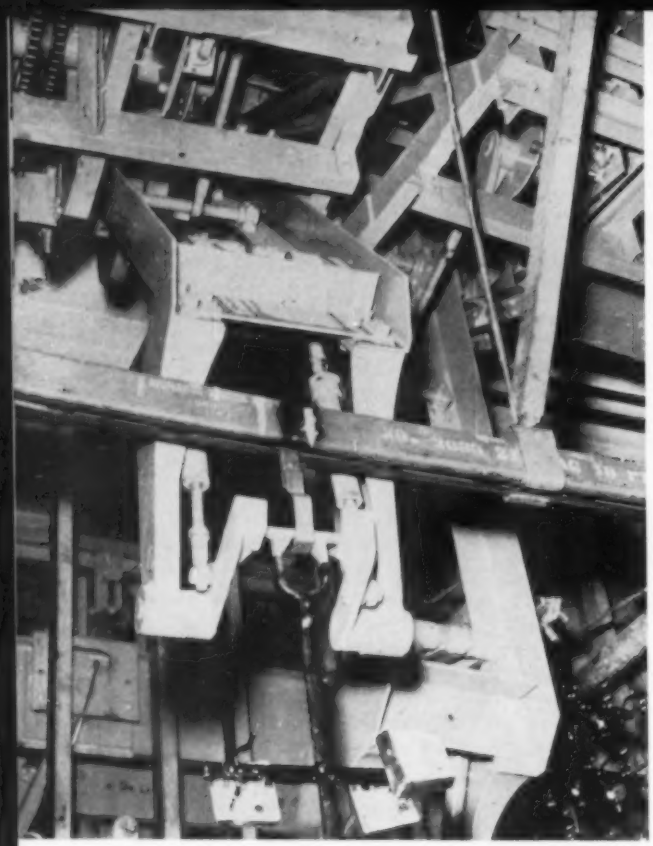
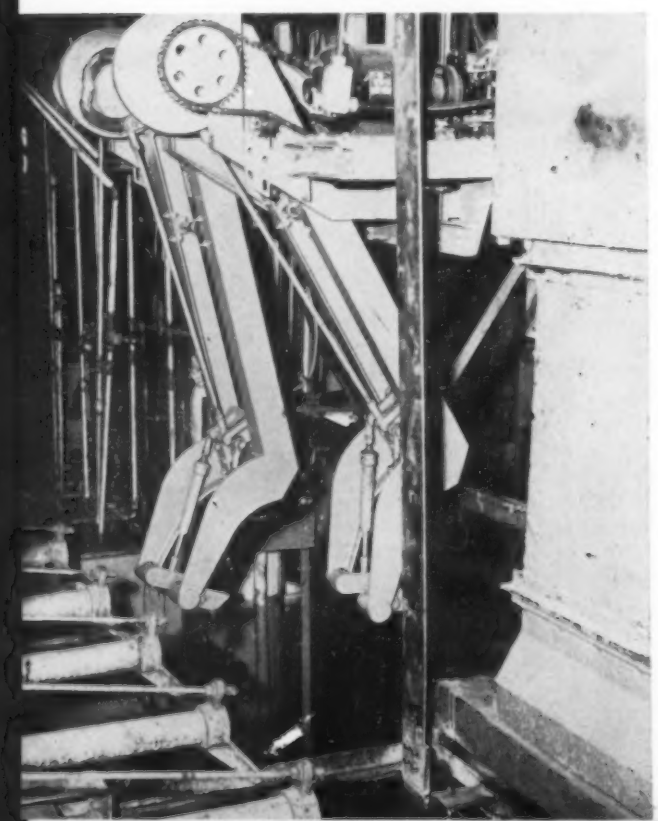


Fig. 4. Automatic loading. A rack is shown being taken from the auxiliary chain conveyor (foreground) by the loading mechanism. It will be loaded on the carrier arm of the plating machine (lower right)

Fig. 5. Loading and unloading mechanisms. A view from the plating conveyor



following the unracking of the plated parts. The operation is performed automatically. Reracking would require the efforts of from four to six workers—all of which amounts to over $16,000 a year.

HOW PLATING IS CARRIED OUT

1. **Racking:** Parts that have been polished, buffed and degreased are placed on the plating racks as they travel along on the overhead auxiliary conveyor. Up to four girls work at the racking station, and they can load 95 racks an hour. Up to 60 small pieces, and from 8 to 16 refrigerator handles, can be placed on a rack.

2. **Automatic Loading:** Racks pass from the racking station to the 85-ton plating conveyor. When they reach the loading station, they are automatically transferred from the auxiliary conveyor to the plating conveyor.

3. **Copper Plating:** Traveling clock-wise around the plating machine, racks are put through the following cycle (the times are typical, but do vary according to individual process requirements.):

Soak Cleaning	3 min 35 sec
Warm Water Rinse	5 sec
Cold Water Rinse	5 sec
Anodic Cleaning	35 sec
Warm Water Rinse	5 sec
Cold Water Rinse	5 sec
Acid Dip	35 sec
Cold Water Rinse	5 sec
Cold Water Rinse	5 sec
Copper Strike	1 min 35 sec
Copper Plating	13 min 35 sec
Reclaim Rinse	5 sec
Warm Water Rinse	5 sec
Cold Water Rinse	5 sec
Cold Water Rinse	5 sec

4. **Nickel Plating:** Parts next pass through the following plating cycle:

Acid Dip	5 sec
Cold Water Rinse	5 sec
Nickel Plating	13 min 35 sec
Reclaim Rinse	5 sec
Cold Water Rinse	5 sec
Cold Water Rinse	5 sec

5. **Chromium Plating:** When required, parts automatically pass through the following plating cycle:

Spray Rinse	5 sec
Chromium Plating	2 min 35 sec
Reclaim Rinse	5 sec
Cold Water Rinse	5 sec
Cold Water Rinse	5 sec
Cold Water Rinse	5 sec

6. **Unloading:** After chromium plating, racks travel two station stops and are then automatically transferred from the plating conveyor to the auxiliary conveyor. The unloading and loading stations are 18 inches apart.

7. **Post-plating:** Racks are now conveyed through a water-spray bath. After this final rinsing, racks pass through a drying oven, receiving blasts of hot air. Oven temperature is between 180°F to 200°F.

Parts are unracked while the racks remain on the monorail conveyor. The racks are subsequently stripped, washed, dried and returned to the racking station.

Supplying current for the electrolytic cleaning baths is a 6,000-amp generator. A 7,500-amp unit supplies the copper, nickel and chromium plating baths. Generators are located in a separate room above the installation. Air is first filtered before entering the room.

To remove fumes from the various processing tanks, an exhaust system was devised that removes 51,000 cubic feet of air per minute, or the equivalent of six air changes per minute.

This plant is currently operating on a 24-hour basis and turning out over 600,000 pieces of work on the new machine each month. A higher quality plating has been achieved, especially with the larger pieces of work. Current distribution has been improved, and better coverage in recessed areas achieved. Less metal is being used now, and less touching up by hand is being done. All in all, plating is now being performed at lower cost.

HOW HIGH QUALITY FINISHES WERE ACHIEVED

1. **Thorough Rinsing:** The possibility of staining has been practically eliminated by introducing three rinses after chromium plating, besides a reclaim rinse. Parts are then subjected to a final rinse of deionized water in a spray cabinet while on the auxiliary conveyor, and subsequently hot-air dried.

2. **Current-on Immersion:** Cathode rails, mounted on insulated supports from the framework of the plating conveyor, are located above and at the back of all electrified tanks. Work enters the plating bath electrified. The operation produces better adhesion, and ultimately a higher quality finish.

3. **Continuous Filtration:** Over the past three years intensive studies have been conducted to improve techniques for the production and finishing of zinc die castings. It was found during the course of these studies that roughness in the deposit often starts in the copper strike operation. This led to the decision to continually filter the copper-strike bath. A 450 GPH filter is used for the job. Copper solution is filtered through one 3,000 GPH filter and nickel solution through another.

4. **Rigid Control:** Control instruments regulate all three plating baths and significant cleaning and rinsing

Fig. 6. Plating Conveyor. Racks in the first tank are completing the copper plating cycle. Rack in the next tank is being rinsed; those in the background are being put through the nickel plating cycle

operations. Besides automatic controls, manual controls for starting and stopping all motors in the system are available, and housed in a panel located near the load station. This panel also contains an electric control for varying immersion time.

One control innovation and safety feature is a trolley stop-cord that runs around the periphery of the plating conveyor. With it, an operator can stop the conveyor from any place on the machine.

5. **High Purity Baths:** Deionized water is used for all final rinses and for making up all plating solutions. Every effort is made to maintain the purity of plating solutions and rinses. A case in point is the acid dip preceding nickel plating, which was found at first to be extremely sensitive to traces of oil on the surface. An overflow weir consequently was placed on the tank to skim oil from the bath's surface.

6. **Close Inspection:** Each part coming off the plating machine is inspected. When a "chrome burn" does show up, the part is set aside. Rejects are few, and most blemishes can be touched up by buffing.

7. **Thorough Testing:** To test adherence, plated castings are baked for one hour at 300°F. All plated castings have to meet this test. It's quite necessary since many parts are painted in certain areas after plating and must withstand the heat of a paint curing process without blistering.

In addition, plate thickness is checked constantly. All solutions in the plating cycle are carefully controlled by the chemical laboratory, which has sole authority for making additions to the solutions. Finally, salt spray and humidity tests are also conducted by the company on plated castings.

ANALYTICAL DETERMINATION OF TRACE CONSTITUENTS IN METAL FINISHING EFFLUENTS

XIV. The Determination of the Chemicial Oxygen Demand of Effluents*

By E. J. SERFASS, R. F. MURACA and D. G. GARDNER

Abstract

A procedure for the determination of the Chemical Oxygen Demand of effluents is presented. The procedure is essentially the same as the one recommended by the APHA for saline waters.

Determination of Chemical Oxygen Demand

The effluents that may be discharged into a stream from a waste treatment plant for the metal finishing industry may contain strong reducing agents or oxidizing agents. The method presented considers oxygen consumed from permanganate as that amount used by the sample when digested for 30 minutes in a hot water bath with a definite strength of alkaline permanganate.

Description of the Method

The sample is made alkaline and then heated to about 100 ° C for 30 minutes in the presence of excess permanganate. The sample is then made acid and the excess permanganate is determined by titrating with a standard solution of ferrous sulfate.

Since the values obtained by this method are empirical, it will be necessary for the various laboratories to follow identical techniques in order to obtain comparable results.

The procedure gives an artificial standard of chemical oxygen demand since materials such as thiocyanate, ethylenediamine tetracetic acid, sulfide, and oxalate, are oxidized by powerful agents such as permanganate but seldom are oxidized by air or oxygen dissolved in the water of rivers and streams.

Limit of Detection of the Method

The limit of detection of the method is the number of micrograms of oxygen that is indicated by a net difference of 0.2 ml of $KMnO_4$ in Step 7 for the 25 ml sample that is taken for analysis. For the recommended procedure, the limit of detection is 25 micrograms of oxygen (1 ppm).

Recommended Procedure

This procedure is essentially the standard method as given in the 9th Edition of "Standard Methods for the Examination of Water and Sewage," APHA (1946).

Reagents Required

(1) **Sulfuric Acid:** 1:3; Carefully add 1 volume of the pure concentrated acid to 3 volumes of distilled water.

(2) **Ammonium Oxalate Solution:** Dissolve 0.8880 g of reagent $(NH_4)_2C_2O_4.H_2O$ in 1 liter of distilled water. One ml is equivalent to 0.1 mg of oxygen. This solution *is not stable* and should be prepared each month. It may be stabilized by making the solution 0.1 N in ammonium hydroxide.

(3) **Potassium Permanganate Solution:** Dissolve 0.4 g of reagent $KMnO_4$ in 1 liter of distilled water. Add 10 ml of this solution and 10 ml of the diluted H_2SO_4 to 100 ml of distilled water in an Erlenmeyer flask, and digest 30 minutes in boiling water. Add 10 ml of the standard $(NH_4)_2C_2O_4$ solution, and then titrate to a pink coloration with the standard $KMnO_4$ solution. This destroys the oxygen consuming capacity of the distilled water. Now add exactly 10 ml of the $(NH_4)_2C_2O_4$ solution and titrate with $KMnO_4$ solution. Adjust the permanganate solution so that 1 ml is equivalent to 1 ml of the oxalate solution or to 0.1 mg of available oxygen. Preserve this solution in a dark glass bottle.

(4) **Sodium Hydroxide Solution:** 33 per cent w/w; dissolve 500 g of NaOH in 1 liter of distilled water. Let settle and decant or filter through a sintered stainless steel funnel. Store in plastic bottles.

(5) **Manganese Sulfate Solution:** Dissolve 67 g of $MnSO_4.4H_2O$ in 500 ml of water. Add 138 ml of 85 per cent H_3PO_4 and 130 ml of concentrated H_2SO_4; dilute to 1 liter.

(6) **Ferrous Ammonium Sulfate Solution:** Dissolve 4.9 g of reagent ferrous ammonium sulfate in 500 ml of recently boiled and cooled distilled water. Add 8 ml of concentrated H_2SO_4 and dilute to 1 liter with recently boiled and cooled distilled water. Add 10 ml of this solution to 100 ml of distilled water containing 25 ml of manganous sulfate solution and titrate with the standard potassium permanganate. Adjust the ferrous ammonium sulfate solution so that 1 ml is equivalent to 1 ml of standard permanganate. The solution must be checked each time that it is used.

Procedure

(1) Pipette a 25 ml sample of the effluent into a 250 ml Erlenmeyer flask, and add 75 ml of water. For a blank, use 100 ml of distilled water in a flask.

(2) Add 0.5 ml of 33 per cent NaOH solution; if necessary, add enough NaOH to neutralize the acidity of the sample and then add an excess of 0.5 ml of 33 per cent NaOH solution.

(3) Add exactly 10 ml of standard permanganate solution from a burette.

(4) Place the flask on a steam bath or in a hot water bath for 30 minutes. If the permanganate is decolorized at any time during the digestion period, add 10 ml increments until a pink color persists.

(5) Remove the flask from the bath; add 25 ml of $MnSO_4$ solution from a graduated cylinder and 10.00 ml of ferrous ammonium sulfate solution from a burette.

(6) Cool to room temperature and titrate with the standard potassium permanganate solution until a faint pink color results that persists for at least 3 minutes.

(7) Calculate the oxygen demand from the following:

ppm of oxygen consumed = 4(A-B- 10.00-C)

where A = Total ml of $KMnO_4$ added to sample,

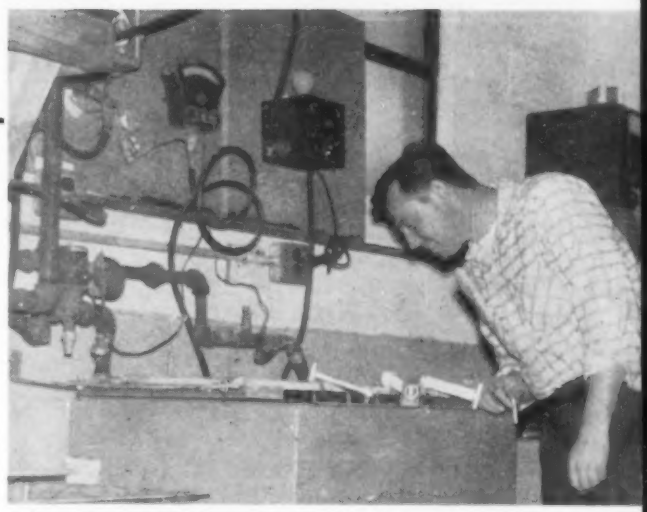
B = Total ml of ferrous ammonium sulfate solution needed to discharge the residual permanganate in the sample;

C = Total ml of ferrous ammonium sulfate solution needed to discharge the residual permanganate in the blank.

* Fourteenth in a series of work sponsored by the AES and the Ohio River Valley Water Sanitation Commission at Lehigh University.

THE SILVER PLATING OF WAVEGUIDES

By LEONARD FOSTER*
AND FRANCIS T. EDDY†



Co-author Leonard Foster, Summit President, inspects a tank-load. Note temperature controls, chronometer and watt-hour meter. At upper right is rectifier.

Television, long distance telephone and military and civilian radar are the present day large users of waveguide. Waveguide are simply the hollow tubes which conduct microwaves from the magnetron (pulse generator) out to the antenna and then return the reflected waves from the antenna back to the measuring equipment. In the same manner as a plumber's pipe conducts water, waveguide conducts microwaves and for this reason is called "Radar Plumbing."

Many and varied advances have been made, and are being made every day in microwave techniques. During peace time, production quantities are small, and experimental orders of one or two are the rule of the day. In this atmosphere, the plater's skill is challenged at every turn—for only rarely does he get to do the same thing twice. New methods and processes for plating have been born of necessity to satisfy specific requirements and problems peculiar to the electronics industry.

Because, like the hydraulic piping water, the microwave engineer conducting waveguide is interested primarily in the inside surface, the plater's problem is multiplied many fold before he starts. He must get good coverage on outside and inside surfaces for corrosion protection and uniform smooth plating for consistent electrical characteristics. It must be remembered always that the most beautifully finished microwave components costing hundreds and thousands of dollars to make, which do not conform electrically, are scrap.

Normally in this field, the finish required is silver plate with sometimes a supplementary plate of either gold or rhodium. Because the main problems are encountered with the preparation and subsequent silver plate, we will be primarily concerned with that system.

Silver plating of waveguide, whether flexible or rigid (types of mechanical construction) serves two fundamental purposes:

(1) Silver plate is an excellent conductor for high frequency microwaves since they do not penetrate the surface to any appreciable extent beyond 0.0002 inch. Also, silver oxide and sulfides appear to be as conductive as silver itself. No other known metal has this unique feature.

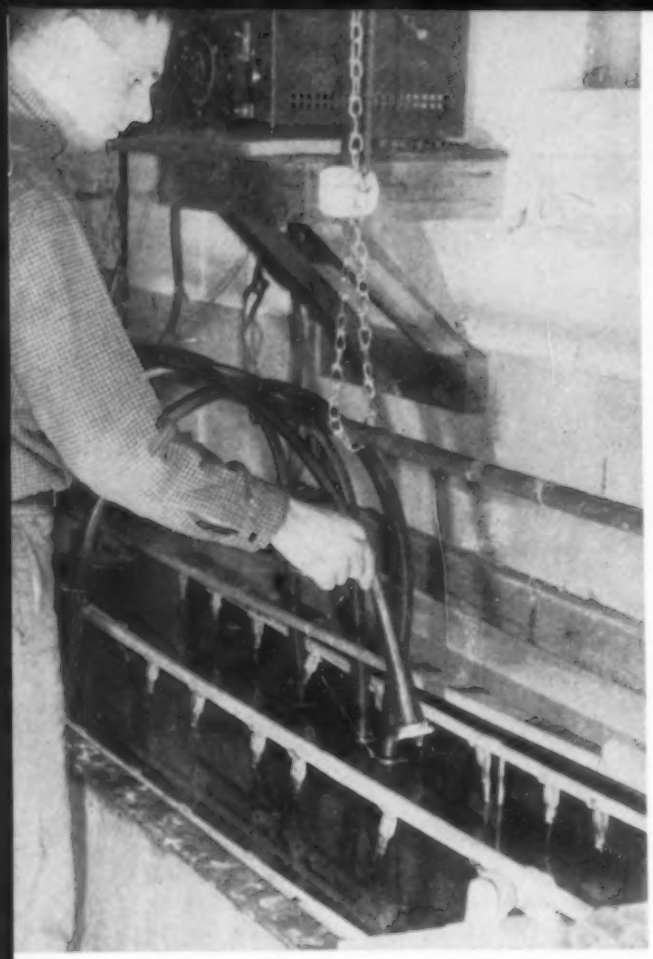
(2) Silver plating is especially adaptable to the complex form encountered in microwave components because of good throwing power (hence even plate thickness), high cathode efficiency and adaptability to periodic reverse processes.

The two most critical problems, excluding cleaning, facing the plater in the processing of waveguide are the necessity of obtaining a uniformly even deposit throughout the inside, outside, and flange surfaces of rectangular tubes which may reach a length of 14 ft, and the plating of soft solder which is widely used to attach various component parts. While the plating of soft solder should not normally preclude too much difficulty in plating, it is quite common in the electronics industry to have solder in the bottom of blind tubes or perhaps in between two right angle bends on the inside of a rectangular tube.

The uniformity of plate on all surfaces is accomplished by computing both the area of the inside and outside surfaces independently and the time and amperes per square foot (current) required to deposit the specified thickness. Internal silver anodes which very closely conform in all respects to the shape and size of the inside of the cathode are introduced.‡ The currents (or current densities) are then closely controlled on the inside of the cathode independent of the outside by means of two separate variable rectifiers with adequate ammeters for accurate control, or by a combination of one variable rectifier and rheostat again with suitable ammeters. In most cases, lineal cathode rod agitation of about 18 feet per minute is satisfactory, but in some cases, solution agitation is beneficial when pumped through the piece, coupled with either vertical cathode agitation or peripheral agitation depending of course on the complexity and physical geometry of the part.

* The Summit Finishing Co., Inc., Thomaston, Conn.
† Technicraft Laboratories, Inc., Thomaston, Conn.

‡ It has been the experience of some operators that conforming anodes made of stainless steel are quite practical from an operating as well as an economic standpoint.



Plating flanged ends of neoprene coated flexible waveguide

The plating of soft solder is made more difficult, in addition to the inaccessibility of some joints, by the necessity of using in preparatory cleaning operations, at least two oxidizing acid dips. It is therefore advisable to prepare the solder for plating after all the operations listed (in the flow chart below) for the removal of scale and soil from the nonferrous parts are accomplished. Mechanical and a chemical cleaning are the two methods which are commonly resorted to for insuring that both lead and tin oxides are removed from the solder prior to plating.

Mechanical cleaning is accomplished by scrubbing the solder joint with the use of soft brass wire brushes or nylon brushes attached to flexible or tapered shafts revolving at a speed of approximately 300 revolutions per minute. A cleansing medium of a neutralizing mixture and No. 00 pumice is used. After very thorough rinsing, the part is immersed in a dilute mixture of fluoboric acid and is ready for plating. It has been found advantageous to employ a dilute mixture of hydrofluoric acid when it is physically impossible to use the pumice scrub.

Because of the large difference in electrical potential between soft solder and copper or brass, great care should be exercised to insure that immediately upon placing the part in the plating bath, sufficient amperage and voltage are applied to the part to overcome the greater electrical resistivity of the solder in relation to the other metals. If the solder is not immediately covered by plate, it will develop a passive film and great difficulty will be encountered in plating. Should this condition become apparent, it is due to either improper cleaning or the lack of sufficient current being impressed on the piece and should be reprocessed, as the resulting plate covering the solder will be nonadherent.

Inserting inside anodes. Note plastic spacers

Packing arrangement to plate flanged ends only. Neoprene covered guide remains out of solution

Due to the requirements that radar installations be made lighter, there has been an ever increasing demand for the use of aluminum throughout the electronics industry. This has brought about the need for new and different techniques within the industry itself in addition to the finishing of aluminum in a variety of ways. The silver plating and soldering of one particular type of assembly is worthy of mention.

This assembly consists of a piece of corrugated copper tubing with a wall thickness of approximately 0.007 inch and two aluminum flanges, alloy 61 ST. The flanges are first copper plated to a thickness of 0.0003 inch (see flow chart). Then they are sent to the attaching department for soft soldering of the copper tubing to the two copper plated aluminum flanges. After several operations to bring the assembly and flanges within mechanical specifications, which usually involves the removal of the copper plate from the aluminum on some surfaces, the assembly is returned for subsequent finishing. At this point, the plater is faced with the problem of either silver plating the assembly overall or silver plating the assembly overall except for contact surfaces (called faying surfaces) of the aluminum flange which may require a chromate coating on that surface only. This must be accomplished on a part which now has an aluminum flange soft soldered to a copper tube on each end.

Due to the great cell potential between copper and aluminum, great difficulty was experienced in obtaining an adherent plate on the aluminum by the zincate method, especially where the two metals were jointed. However, this was eventually overcome, and these assemblies are now processed on a production basis with much success (see flow chart).

Another requirement that has been met is the selective copper plating of the cross sectional wall only of a complex aluminum rigid waveguide, alloy 2S and 61 ST, to a thickness of 0.0005 inches which, after unmasking, receives a chromate type treatment overall.

There is then soft soldered to the copper plated end a silver plated piece of beryllium copper tubing. It has been found that if the copper plate is sufficiently bonded to the aluminum part and proper precautions are taken in attaching, fracture of the solder joint will occur prior to the separation of the copper plate from the aluminum.

Because of the great variety of assemblies and the numerous diverse processes required for each type, the flow charts given below are a generalization of the cleaning and plating procedures commonly employed.

Masking areas of aluminum flange not to be copper plated

CLEANING AND PLATING PROCEDURE FOR BRASS-FLANGED BERYLLIUM COPPER WAVEGUIDE

1—Soak clean
2—Rack inside anode
3—Cathodic electro-clean
4—Unrack inside anode
5—Sulfuric acid soak
6—Bichromate pickle
7—Bright dip
8—Pumice scrub
9—Fluoboric or hydrofluoric acid dip
10—Cyanide dip
11—Rack inside anode
12—Copper strike
13—Silver strike
14—Silver plate
15—Unrack inside anode
16—Rack inside anode
17—Cathodic electro-clean

18—Cyanide dip	or	18—Sulfuric acid dip
19—Gold strike		19—Rhodium plate

Adequate running water rinses between all steps.

CLEANING ADD PLATING PROCEDURE FOR ALUMINUM FLANGES No. 61 ST

1—Caustic etch
2—Nitric acid dip
3—Zincate treatment
4—Nitric acid dip
5—Zincate treatment
6—Copper strike
7—Copper plate

Adequate running water rinses between all steps.

CLEANING AND PLATING PROCEDURE FOR BRASS-FLANGED COPPER SEAMLESS WAVEGUIDE JOINED WITH SOFT SOLDER

1—Soak clean
2—Rack inside anode
3—Cathodic electro-clean
4—Unrack inside anode
5—Bichromate pickle
6—Bright dip
7—Pumice scrub
8—Fluoboric dip or hydrofluoric dip
9—Cyanide dip
10—Rack inside anode
11—Copper strike
12—Silver strike
13—Silver plate
14—Unrack inside anode
15—Rack inside anode
16—Cathodic electro-clean

17—Cyanide dip — 17—Sulfuric acid dip
18—Gold strike — or — 18—Rhodium plate
19—Gold plate

Adequate running water rinses between all steps.

CLEANING AND PLATING PROCEDURE FOR ALUMINUM-FLANGED COPPER SEAMLESS WAVEGUIDE WITH SOFT SOLDER

1—Strip copper plate from aluminum
2—Caustic etch
3—Acid dip
4—Acid dip
5—Zincate treatment
6—Rack inside anode
7—Copper flash
8—Unrack inside anode
9—Pumice scrub
10—Rack inside anode
11—Silver strike
12—Silver plate
13—Bake at 200°F for 2 hours
14—Inspect bond
15—Rack inside anode
16—Cathodic electro-clean

17—Cyanide dip — 17—Sulfuric acid dip
18—Gold strike — or — 18—Rhodium plate
19—Gold plate

Adequate running water rinses between all steps.

Plating flanged ends of flexible waveguide which will be later neoprene coated

A typical plating solution used is:

Silver	3 2 oz/gal (Troy)
Silver Cyanide	4 oz/gal
Free Potassium Cyanide	5 5 oz/gal
Potassium Carbonate	6 oz/gal

Lea Bright Silver solution with a Potassium formulation is used:

Cyanide	6 oz/gal
Potassium Cyanide	11 to 14 oz/gal
Free Cyanide	8 to 10 oz/gal
Potassium Carbonate	2 to 4 oz/gal

with the same silver contents as above.

Brighteners are added in accordance with proprietary recommendations.

Silver strike	0.5 to 0.7 oz/gal (avoirdupois)
Sodium Cyanide	8 to 10 oz/gal

We feel that this paper is a significant indication of some of the challenges which are facing the electroplating industry and which through endeavor, foresight, and some amount of ingenuity are being met. It also purports to indicate the great amount of cooperation and forbearance which is absolutely necessary to achieve between manufacturers and finishers before any specific finishing problems can be solved.

Francis T. Eddy, Second Vice-President, born in Pittsfield, Mass., July 2, 1915; received his AB degree in chemistry from Brown University in 1937 and attended the Juilliard School of Music, New York, from 1939–1940.

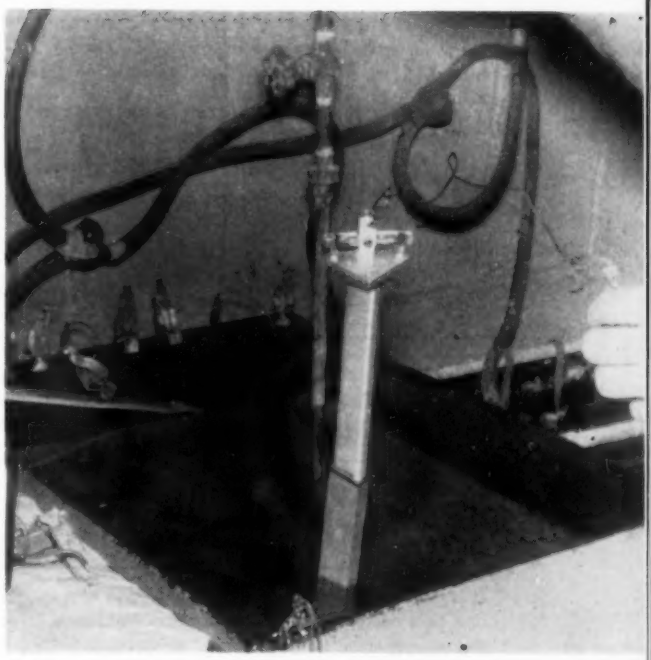
Associated with the Chase Brass and Copper Company, Waterbury, Connecticut, 1946–1954 as superintendent of finishing and assistant plant superintendent. Now general manager Technicraft Laboratories, Inc., Thomastown, Connecticut.

Served as president of the Waterbury Branch; chairman of the New England Regional meeting; chairman of the AES Paper Awards Committee and has been an AES member since 1938; was on ASTM B-8 Committee.

Performed meritoriously in World War II in the U. S. Navy as LCT and LST commander and attained grade of lieutenant.

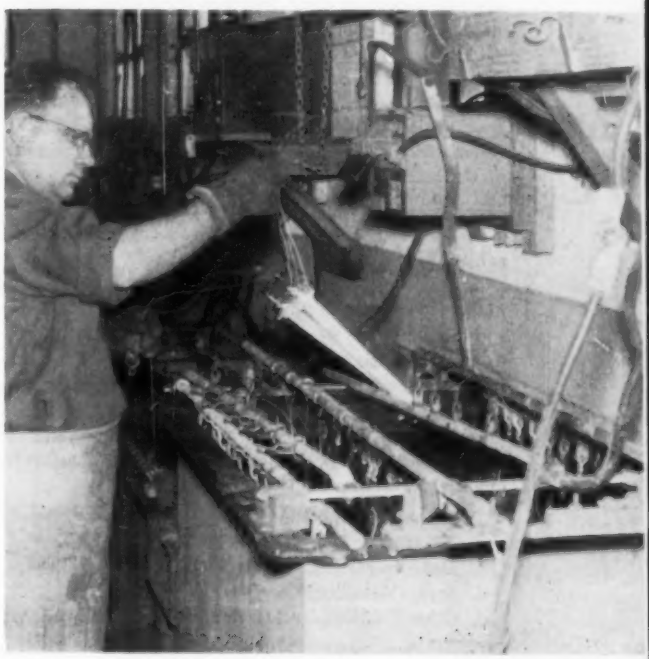
Leonard B. Foster, President and Treasurer of The Summit Finishing Co., Inc., Thomaston, Conn. has been associated with the electroplating industry for the past eight years in his present capacity. Under his direction, The Summit Finishing Co., Inc. has developed several unique processes for obtaining the necessary quality and control required in the electroplating of waveguides.

After returning from overseas duty with the U. S. Army, he founded the present company which has been engaged from its inception in satisfying the finishing requirements of the electronics industry.



Assembly with copper seamless tubing aluminum flanges and inside anodes being lowered into the tank

Operator removing silver plated assembly from plating tank. Shown are inside anode connections. Other parts are in the tank with complicated wiring shown



DIGEST OF

GOVERNMENT SPECIFICATIONS

METAL COATING AND SURFACE TREATMENTS (OTHER THAN ORGANIC COATINGS)

By N. E. Promisel*

This is a new feature in PLATING Magazine to provide insofar as is practical an accurate, up-to-date digest of the most widely used Government metal coating and surface treatment specifications. It is currently planned, subject to future change, to publish revisions from time to time.

CAUTION IN USING SPECIFICATIONS

It is essential to determine the applicability of a specification to a particular job because other requirements, at times, are specified in the contract or drawing. Also, it is important that the note section and the section covering departmental requirements be reviewed for applicability. Use the specification or specifications called out in the contract.

Federal specifications have the broadest coverage for the most general usage and are used by the greatest number of Government agencies.

Military specifications, in general, cover Department of Defense needs; in a few instances they cover unique requirements of the department or agency such as MIL (NAVY) and MIL (AER) for Navy Department and Navy Department, Bureau of Aeronautics, respectively. Generally, the departmental or agency type of military specification is issued as a matter of urgency, pending full coordination with all of the agencies of the Department of Defense.

Specifications may be of the types as follows:

a. Performance—coated article or separate specimen subject to specification tests.

b. Process—process used must conform to that specified and the process conditions must operate within the limits specified.

c. Qualification—Because the test procedures to establish product quality are lengthy and expensive, only previously qualified processes (or materials) can be used in production. Specifications cover qualification procedure and tests and certain performance and process requirements for quality control of production articles.

The digest is divided into groups as follows:

a. Electrodeposited Metallic Coatings
b. Hot-Dip Metallic Coatings
c. Spray-Metallized Coatings
d. Other Coatings for Aluminum Alloys
e. Other Coatings for Magnesium Alloys
f. Other Coatings for Steel
g. Other Related Specifications.

Certain other specifications may be listed as applicable in whole or part; these should be obtained and the applicable parts used.

Activities may obtain copies of Federal Specifications and Standards as outlined under "General Information" in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

(Single copies of Federal specifications and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, Seattle, and Washington, D. C.)

Copies of any specification required by contractors should be obtained from the procuring agency, its representative or as directed by the contracting officer.

ELECTRODEPOSITED METALLIC COATINGS

FEDERAL SPECIFICATIONS (Performance Type):
QQ-P-416—12 September 1949
Plating, Cadmium (Electrodeposited) and Amendment -1 of 1 June 1951.
Types:
Type I —Without supplementary chromate treatment
Type II —With supplementary chromate treatment
Type III—With supplementary phosphate treatment
Classes:
Class A—0.0005 inch thick.
Class B—0.0003 inch thick.
Class C—0.0002 inch thick.
Specification in process of revision to conform to new

* Department of the Navy

format. Note different departmental and agency requirements.

QQ-Z-325—21 January 1952
Zinc Plating (Electrodeposited)
Classes:
Class 1—0.0010 inch thick.
Class 2—0.00050 inch thick.
Class 3—0.00020 inch thick.
Types:
Type I —Without supplementary chromate or phosphate treatment
Type II —With supplementary chromate treatment
Type III—With supplementary phosphate treatment
Note different departmental and agency requirements.

QQ-C-320—July 26, 1954
Chromium Plating (Electrodeposited)
Class 1—Decorative plating
Class 2—Engineering plating. Plated to specified dimensions or processed to specified dimensions after plating
Class 1 chromium plating is of the following types:
Type I —Bright
Type II—Satin
Class 1 plating is applied over nickel or copper plus nickel coatings which are covered in nickel plating specification—QQ-N-290. The thickness is 0.00001 inch minimum. Note different departmental and agency requirements.
Class 2 plating thickness is usually specified in the contract or drawing.

QQ-N-290—April 5, 1954
Nickel Plating (Electrodeposited)
Class 1—Decorative plating
Class 2—Engineering plating plated to specified dimensions or processed to specified dimensions after plating.
Types—Class 1 nickel plating is of the following types, as specified:
Type I (DS)*—on steel basis metal—0.002 inch copper plus nickel
Type II (FS) —on steel basis metal—0.00125 inch copper plus nickel
Type III (KS) —on steel basis metal—0.00075 inch copper plus nickel
Type IV (QS) —on steel basis metal—0.0004 inch copper plus nickel
Type V (FC) —on copper-alloy basis metal—0.0005 inch nickel
Type VI (KC) —on copper-alloy basis metal—0.0003 inch nickel
Type III—Dichromate Treatment—For general long time protection of all alloys except magnesium-manganese and magnesium cerium alloys, including work for which close dimensional tolerances are required. Parts processed by this treatment are not to be subjected to temperatures above 500° F.
Type IV —Galvanic Anodizing Treatment—For general long time protection of all alloys when close dimensional tolerances are required. Parts processed by this treatment are not to be subjected to temperatures above 500° F.
Type V —Caustic Anodizing Treatment—For general long time protection of all alloys when close dimensional tolerances are not required. Parts processed by this treatment are not to be subjected to temperatures above 680° F.

MILITARY SPECIFICATION (PERFORMANCE TYPE)
MIL-C-13335 (ORD)—23 March 1954
Coating for Magnesium and Magnesium Alloys
Covers anodic coatings (HAE)
Class 1—Without supplementary treatment
Class 2—With supplementary treatment
In prospect of revision to cover Type IV—of MIL-M-3171A and other anodic coatings.

OTHER COATINGS FOR STEEL

MILITARY SPECIFICATION (QUALIFICATION TYPE)
MIL-C-16232A (NOrd)—1 February 1955
Coatings, Phosphate, heavy (Manganese and zinc type) and Phosphate Treating Solutions
Type I —Manganese base coating. For corrosion and wear resistance
Type II—Zinc base coating. For corrosion resistance
Qualification of materials required as is approval of procedure before processing work.
Quality control by salt spray response and weight of coating.

Minimum Weight
Type I —1500 milligrams per square foot
Type II—1000 milligrams per square foot

DEFENSE DEPARTMENT COORDINATION IN PROCESS

MILITARY SPECIFICATION (PERFORMANCE AND PROCESS TYPE)
MIL-F-14924 (Ord)—23 December 1954
Finish, Black Oxide, For Iron and Steel
Class 1—Alkaline Oxidizing Processes
Grade A—Finished with non-drying petroleum oils
Grade B—Finished with rust-inhibiting lacquer
Grade C—Finished with synthetic resin coating
Class 2—Alkaline-chromate oxidizing process (for corrosion-resistant steels)
Class 3—Fused salt oxidizing process (for all grades of corrosion-resistant alloy and carbon steels)
Quality control by salt spray response.

Other Related Specifications———
MIL-C-490-A—7 May 1954

Cleaning and Preparation of Ferrous and Zinc Coated Surfaces for Organic Protective Coatings

Grade I —A crystalline phosphate base coating for use as preparation for painting iron, steel and zinc-coated steel; and, when specified, zinc alloys, or aluminum surfaces

Grade II—Cleaning treatments which leave the metal surface substantially bare

Type 1—Mechanical (sand, shot, grit, or seed blasting preceded by degreasing if necessary to assure a grease-free surface and followed by cleaning to remove dust and metal particles) (for ferrous surfaces only)

Type 2—Hot alkaline cleaning (immersion, spray, or electrocleaning) (for ferrous surfaces only)

Type 3—Solvent cleaning (immersion, spray or vapor)

Type 4—Alcoholic phosphoric acid cleaning

Type 5—Cleaning with hot phosphoric acid solution containing a detergent

Type 6—Emulsion cleaning (cleaner applied with or without added water, and followed by a water rinse)

MIL-S-13165 (ORD)—11 December 1953

Shot Peening of Ferrous Metal Parts

Covers shot peening of ferrous materials to increase fatigue strength. This treatment is required for certain applications involving chromium and nickel plating.

Defense Department Coordination in Process.

Type VII (QC) —on copper-alloy basis metal—0.0001 inch nickel

Type VIII (FZ) —on zinc-alloy basis metal—0.00125 inch copper plus nickel

Type IX (KZ) —on zinc-alloy basis metal—0.00075 inch copper plus nickel

Type X (QZ) —on zinc-alloy basis metal—0.0005 inch copper plus nickel

Class 2 plating thickness is usually specified in the contract or drawing. Note different departmental and agency requirements.

Permission to use electroless nickel coating should be obtained for each application from the agency concerned.

QQ-S-365—March 9, 1954

Silver Plating (Electrodeposited) and Amendment -1 of 14 October 1954.

Type I —Matte

Type II —Semi-bright

Type III—Bright

The minimum plating thickness is 0.0005 inch on all surfaces on which silver is functionally necessary (for example, appearance, wear, corrosion, protection, conductivity). Note different departmental and agency requirements.

Military Specification (Performance Type)———

MIL-T-10727 (Ord)—28 November 1950

Tin Plating: Ferrous and Non-Ferrous Metals

Type I —Electrodeposited

Type II—Hot-dipped

Minimum thickness specified on drawing or in contract.

MIL-P-18317 (NOrd)—22 December 1954

Plating, Black Nickel (Electrodeposited) on Brass, Bronze, or Steel

No minimum thickness specified; surface to be plated shall be completely covered.

Military Specification (Qualification Type)———

MIL-P-20218—29 October 1951

Plating, Chromium Electrodeposited, Porous (On Cylinder Bores of Internal Combustion Engines)

Type I —Channel

Type II—Pin-point

Thickness: not less than 0.005 inch radial, after final honing

Porosity: "Average" 20 to 50 per cent over the area swept by piston rings

Qualification test required prior to use; satisfactory performance as determined by engine test required. Production articles must conform to specification requirements.

HOT DIP METALLIC COATINGS

MILITARY SPECIFICATION (PERFORMANCE TYPE)

Tin Plating—See Type II of MIL-T-10727 (Ord)

MILITARY SPECIFICATIONS (PROCESS TYPE)

MIL-Z-17871 (NAVY)—10 January 1955

Zinc-Coating (Hot-Dip Galvanizing)

Process limits must be met with respect to:

(a) Composition of molten zinc

(b) Temperature of molten zinc bath

(c) Immersion time

(d) Dross level of bath

Quality control tests specified for coatings.

Defense Department Coordination in Process

SPRAY-METALLIZED COATINGS

MILITARY SPECIFICATION (PROCESS TYPE)

MIL-M-6874—7 August 1950

Metal Spraying, Process for

Covers general requirements for the apparatus, material and procedure to be used in metal spraying of aircraft parts for protection against corrosion and for building up worn metal surfaces.

OTHER COATINGS FOR ALUMINUM ALLOYS

MILITARY SPECIFICATION (PROCESS TYPE)

MIL-A-8625A—14 December 1954

Anodic Coatings, for Aluminum and Aluminum Alloys
Type I —Chromic-acid coatings
Type II—Sulfuric-acid coatings

Process limits must be met with respect to:

a. voltage
b. anode current density
c. solution temperature
d. post anodic treatments

Quality control by either salt spray response or by coating weight. Note departmental and agency differences with respect to quality control requirements.

Anodic Coating Weight

Anodic Coatings	Milligrams per sq ft		Milligrams per sq dm	
	Nondyed	Dyed	Nondyed	Dyed
Type I	200	500	22	54
Type II	600	2,500	65	270

MILITARY SPECIFICATION (QUALIFICATION TYPE)

MIL-C-5541—9 January 1950

Chemical Films for Aluminum and Aluminum Alloys and amendment -1 of 28 March 1950.

Requires qualification of materials before use of process. Inspection tests required for production work. Undergoing revision to establish classes and types.

OTHER COATINGS FOR MAGNESIUM ALLOYS

MILITARY SPECIFICATION (PROCESS TYPE)

MIL-M-3171A—13 April 1954

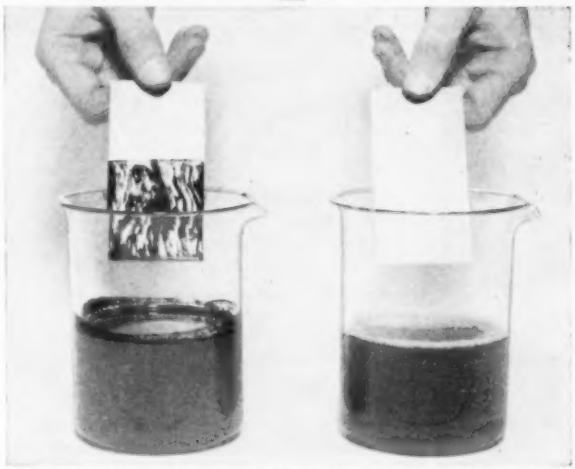
Magnesium Alloy, Processes for Corrosion Protection of

Type I —Chrome-Pickle Treatment—For temporary storage, domestic shipment, electrical bonding, touching up of previously treated work, and brush application when permitted. Applicable to all alloys when close dimensional tolerances are not required. Parts processed by this treatment are not to be subjected to temperatures above 500° F.

Type II —Sealed Chrome-Pickle Treatment—For general long time protection of all alloys when close dimensional tolerances are not required. Parts processed by this treatment are not to be subjected to temperatures above 500° F.

INDICATE A 562.

Pre-cleaning for Automatic Plating Lines



WHY YOU MAY BE GETTING TOO MANY REJECTS. *Difference in rinsing properties of two cleaners is clearly shown above. Beaker at left contains a conventional cleaner in general use. Beaker at right contains a solution of Diversey 909 Heavy Duty Cleaner. Identical amounts of grease and dirt are added to each beaker. Notice how soil clings to metal strip inserted in conventional cleaner, while work dipped in Diversey 909 at right is free of waterbreaks.*

How Free-Rinse Process

CUTS COSTLY REJECTS

Automatic plating lines put unusually heavy demands on cleaning materials. Cleaners that lack fast wetting action can't do a thorough cleaning job within the fixed limits of the automatic cycle. Cleaners that lack free-rinsing properties will cause "drag-out" that contaminates other tanks and causes rejects. Many cleaners lack capacity to hold large amounts of contamination, which means frequent shutdowns of the line to dump solution. Unstable cleaners cause constant adjustment and titration problems.

To meet the strict demands for cleaning in automatic lines, The Diversey Corporation has developed a series of cleaners that eliminate these serious problems and produce far superior results at lower overall costs. The Diversey process includes the following recommended cleaners:

For pre-soaking: Diversey #909 Heavy Duty Cleaner. Advantages—faster wetting action which means that cleaning starts sooner; longer solution life due to high capacity for holding contamination; free-draining and rinsing, eliminating problems of "drag-out"; non-caustic, safe to handle.

For electro-cleaning: Diversey #12 Electro-Cleaner. Advantages—faster acting due to excellent current-carrying capacity; controls foaming, thus reducing explosion danger caused by build-up of gas under heavy foam blankets.

For spray-cleaning: Diversey #519 Spray Cleaner. Advantages—faster wetting action, better emulsification; long solution life; free rinsing without waterbreaks; non-caustic.

Your nearby Diversey D-Man will be glad to demonstrate how the Diversey process will give you (a) superior cleaning, (b) easier and more effective control due to the uniformity of solutions, (c) longer runs without shutdowns. For free illustrated brochures on Diversey metal cleaners, write today on your letterhead to Metal Industries Department, The Diversey Corporation, 1820 Roscoe St., Chicago 13, Illinois.

PATENT ABSTRACTS

DR. D. GARDNER FOULKE
Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,728,720, December 27, 1955—Method of Producing an Electroplate of Nickel on Magnesium and Magnesium Base Alloys—H. DeLong, assignor to Dow Chemical Company, Midland, Mich.

This invention relates to the deposition of soft, ductile nickel electrodeposits of nickel on magnesium. The magnesium object is first defilmed in a dilute acid solution of a soluble fluoride, then transferred without drying to a nickel solution containing nickel bifluoride, hydrogen fluoride at a *p*H of 1–3 and containing 10–51 g/l of an organic polybasic acid, eg tartaric and citric. The temperature is given as 125°–140° F and the current density as 30–100 asf.

3 claims.

—AES—

No. 2,729,580, January 3, 1956—Method of Improving the Uniformity of Corrodibility of Welded Nickel Anodes—W. Pinner and O. Hoxie, assignors to Houdaille-Hershey Corporation, Detroit, Mich.

To decrease the corrodibility of the weld when electrolytic nickel sheets are welded together to make anodes for nickel plating, said welded sheets are heat treated at 1400° F–2100° F for a sufficient period of time to effect a substantially equalized grain growth of the nickel in said anode and around the weld.

1 claim, 1 figure.

—AES—

No. 2,729,601, January 3, 1956—Electroplating on Beryllium—J. Beach and C. Faust, assignors to U.S.A. (Atomic Energy Commission).

The procedure for plating on beryllium includes anodic treatment (100 ± 50 asf) in a phosphoric-hydrochloric acid mixture (10 per cent of 85 per cent H_3PO_4 and 2 per cent of 38 per cent HCl), immersion in 70 per cent nitric acid for two minutes at 70–90° F followed by plating. Iron, copper, nickel and silver deposits are mentioned specifically in the claims while tin and manganese are disclosed as are bath formulas. The first anodic treatment is preceded by normal cleaning steps.

7 claims, figure.

—AES—

No. 2,729,602, January 3, 1956—Electrodeposition of Bright Zinc Plate—G. Van Houten, Greenfield, Ind.

The claims refer to acid zinc plating and state that 0.01–20 mg/l o /selenium or tellurium yields bright deposits. Claim 10 described the use of a lead anode containing not over 0.005 per cent of the additive as a means of maintaining the additive concentration.

10 claims.

—AES—

No. 2,728,718, December 27, 1955—Aluminum Coating—W. Schickner, assignor to Battelle Development Corporation, Columbus, Ohio.

The process consists of plating aluminum from an aromatic hydrocarbon solvent in which is dissolved the fusion product of an aluminum halide and a quaternary salt of nitrogen. Claim 2 mentions a N-alkyl pyridium halide.

6 claims.

No. 2,728,695, December 27, 1955—Corrosion Resistant Coating—J. Harrison, assignor to E. I. duPont deNemours & Company, Wilmington, Del.

This method of protecting ferrous metal involves contacting the metal successively with a solution containing a reducing agent such as alkali and alkaline earth metal, their cyanates or 8-hydroxyquinoline and then a solution containing an alkali metal ferrate.

5 claims.

—AES—

No. 2,727,856, December 20, 1955—Method of Electrodepositing a Metallic Coating—J. Beach, assignor to the United States of America (Army).

The claims treat the deposition of a bright lead-zinc alloy of 0.5–4 per cent zinc content. The solution contains 100 g/l of zinc cyanide, 75–100 g/l of sodium hydroxide, 35–40 g/l of sodium cyanide, 3 g/l of basic lead acetate, 25–30 g/l of potassium sodium tartrate, 4–6 g/l of sodium fluoride, 3 g/l of gum arabic, and 10–20 ml/l of a betaine. The current density is given as 3 asf and the temperature as 50°C.

2 claims.

—AES—

No. 2,727,858, December 20, 1955—Plating Fixture—Frank Klein, assignor to General Motors Corporation, Detroit, Mich.

A rack is described to provide for the plating of semicircular bearings, keeping said bearings in alignment during the plating process.

3 claims, 5 figures.

—AES—

No. 2,728,639, December 27, 1955—Detection of Cyanides—P. McConnaughey, assignor to Mine Safety Appliances Company, Pittsburgh, Pa.

A colorimetric reagent for a cyanide of the formula RCN(R = K or CH_2=CH) is described as a solution of o-toluidine, copper sulfate or acetate and a polyhydric alcohol.

18 claims.

—AES—

No. 2,728,652, December 27, 1955—Corrosion Inhibitor—F. Hance, assignor to Hawaiian Development Company, Honolulu.

A corrosion inhibitor containing sodium tripolyphosphate and sodium chromate is described.

8 claims.

—AES—

No. 2,730,490, January 10, 1955—Process for Zinc Coating Magnesium Articles—R. Hendrich and D. O'Brien, Jr., assignors to Wire Coating and Manufacturing Company, Cleveland, Ohio.

This process includes (1) the deposition of zinc by immersion in the magnesium followed by (2) plating zinc from a cyanide bath upon the "superficial uniformly discontinuous layer of zinc." Claim 6 notes the application to photoengraving printing plates.

Typical immersion zinc baths disclosed are:

No. 1		No. 2	
$Na_4P_4O_7$	16 oz/gal	Na salt EDTA	30 oz/gal
$ZnSO_4H_2O$	4 oz/gal	Zn CO_3	4.5 oz/gal
Na F	0.67 oz/gal	Boric Acid	6 oz/gal
Na_2CO_3	0.67 oz/gal		
*p*H	10.2–10.4		

7 claims.

—AES—

No. 2,730,491, January 10, 1956—Method of Electroplating Cobalt-Nickel Composition—W. Moline and R. Clinehans, assignors to National Cash Register Company, Dayton, Ohio.

This invention refers to the deposition of cobalt-nickel coatings (0.00025–0.0015 inches preferably) with magnetic recording char-

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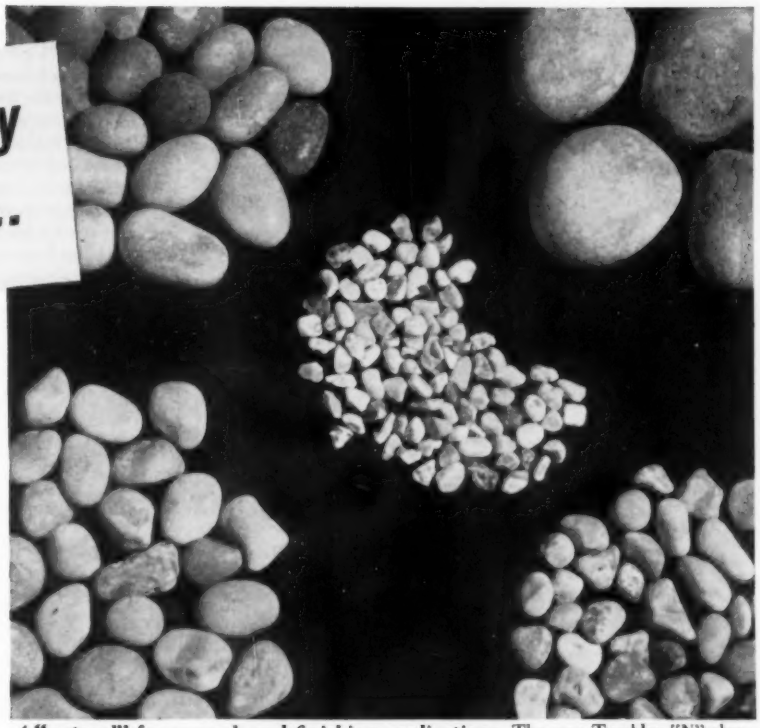

A "natural" for many barrel-finishing applications. The new Tumblex "N" abrasive, offered exclusively by Norton comes in sizes ranging from 3/16" by 3/8" to 1 5/8" by 2 1/2".

NEW TUMBLEX "N" TUMBLING ABRASIVE

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Tumblex "N" has proved particularly valuable in bringing out the most desirable color of the finished part. Metals on which it has proved its ability to give an excellent finish include zinc, brass, copper, aluminum and various forms of steel, including stainless.

Its rounded, uniform shape and very low breakdown ratio permit longer cycles and reduce the need of rescreening.

Another big Tumblex "N" advantage is extremely uniform cutting action. This assures the same uniform finishing in load after load. Also, it enables close regulation of cut; for example, by adding measured quantities of loose abrasive grain to Tumblex "N" you can speed up the rate of cut with little effect on the life of this natural abrasive. Exact formulas for best results in job or production tumbling are easily worked out.

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- *"Very good luster with no noticeable wear."*
- *"Fine performance. Very little breakdown. Reordering 700 pounds of sizes 2½T and 3½T."*
- *"Color O.K. on both zinc and brass."*
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Have you taken the four good steps?

How can cleaning costs be reduced 33% while cleaning quality is being improved? *See pages 7 and 8 in the booklet.*

What are four easy ways to improve the average rinse tank? *See page 10.*

What causes hydrogen embrittlement during electrocleaning? What is the remedy? *See pages 15 and 16.*

Do you need a brass cleaner that gives better protection against tarnishing?

Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current.

"It cut our cleaning rejects by more than 90%"

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FEWER REJECTS—Major causes of blistering and peeling eliminated . . . Consistent success in baking for 60 minutes at 300°F.

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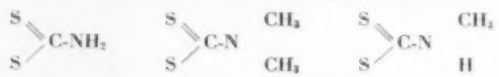
acteristics. The nickel content is given as 10–75 g/l, the cobalt content 25–75 g/l along with boric acid 5–45 g/l and 1–3 g/l of *ortho* or *para*-toluene sulfonamide. Alternating current is passed between the electrodes, the connection from one electrode to the alternating current source being a direct connection and the connection to the other electrode being divided into two parallel branches, one branch containing a first half-wave rectifier and a first impedance, and the second branch containing a second half-wave rectifier oriented electrically to pass current in the opposite direction with respect to the first rectifier. The second branch contains an impedance different from the first impedance. This makes for a plating phase and a deplating phase and the impedances are selected to provide an average plating current 1 to 10 times the average deplating current density. Various claims cover nickel chloride and cobalt chloride as the salts, plating current densities of the order of 100–1400 asf and deplating current densities of 32–480 asf.

6 claims, 6 figures.

—AES—

No. 2,730,492, January 10, 1956—Electrodeposition of Zinc-Copper Alloys—A. Chester, assignor to Poor & Company, Chicago, Ill.

An alkaline-zinc-copper cyanide bath containing in solution a bath soluble dithiocarbonate having a radical from the group:



is described. The quantity of tethiocarbomate to be sufficient to extend current density range for zinc-copper alloy deposition.

Other claims cover zinc aldonate, zinc gluconate and refer to white brass (i.e. zinc 85–70 per cent and copper 15–30 per cent) coatings.

14 claims.

—AES—

No. 2,730,494, January 10, 1955—Process of Electrolytically Deburring of Metal—Milton H. Bennert, assignor to General Motors Corporation, Detroit, Mich.

This process describes a method for electrolytically removing burrs or smoothening metal by means of a two bath system. The metal is first anodically treated in hydrochloric acid which leaves a smut, then in a second bath of hydrochloric and phosphoric acids or just phosphoric acid.

The first bath is an aqueous solution of 2–60 per cent by volume of commercial hydrochloric acid. The second bath may contain (a) 20–95 parts by volume of 85 per cent phosphoric acid, 2–10 parts by volume of concentrated hydrochloric acid and 5–20 parts of water or (b) 80–95 parts of phosphoric acid and 5–20 parts by volume of water.

7 claims.

—AES—

No. 2,731,361, January 17, 1956—Catalyzed Deposition of Metals from the Gaseous State—H. Troy and J. Whitacre, assignors to Commonwealth Engineering Company, Dayton, Ohio.

Carbon monoxide when exposed to "active" nickel and subsequently passed over metals to be gas plated conditions the metal surface so that it is particularly receptive to the metal of the nickel carbonyl. Claim 1 calls for heating the metal body to a temperature of 500–800° F, heating the "active" nickel to 1200–1525° F then passing a stream of carbon monoxide over the nickel and metal followed by cooling the nickel and metal to a lower temperature at which time carbon monoxide and nickel carbonyl are introduced and plating from the gas phase occurs.

5 claims, figure.

No. 2,731,362, January 17, 1956—Aluminum Coating of Ferrous Metal Articles—K. Brondyke, assignor to Aluminum Company of America, Pittsburgh, Pa.

The flux claimed useful prior to hot-dip aluminizing is a dry solid chloride-free material containing 65–85 per cent by weight of an alkali metal bromide and 15–30 per cent of potassium or potassium acid fluoride. Claim 2 describes the use of an aqueous solution of this flux in the proportion of 0.01–0.25 lb per pound of water.

10 claims.

—AES—

No. 2,731,365, January 17, 1956—Method of Vapor Depositing Coatings of Aluminum—A. Weinrich, assignor to Libbey-Owens-Ford Glass Company, Toledo, Ohio.

The method consists of vacuum evaporation of an aluminum alloy from a molybdenum, tantalum or columbium filament, said aluminum alloy containing 0.5–10 per cent molybdenum which it is claimed coacts with the filament and aluminum to retard the speed at which the aluminum spreads out on the filament.

2 claims, figure.

See also No. 2,731,366 by A. Weinrich covering an aluminum-tungsten alloy.—5 claims, figure.

—AES—

No. 2,731,402, January 17, 1956—Production of Metallic Titanium—A. Topinka and Q. McKenna, assignors to Horizons Titanium Corporation, Princeton, N. J.

This patent describes the preparation of titanium in the form of particles substantially all of which are larger than 325 mesh. This is done by electrolysis of a fused electrolyte containing alkali metal or alkaline earth halides and an alkali metal fluotitanate containing more than 0.02 per cent trivalent impurities (Al, Cr, Fe, V).

5 claims.

See also patents Nos. 2,731,404, 2,731,405 and 2,731,406 assigned to the same corporation, with 13, 4 and 2 claims, respectively.

—AES—

No. 2,731,403, January 17, 1956—Manufacture of Nickel Plated Steel—M. Rubin, assignor to Pittsburgh Steel Corporation, Pittsburgh, Pa.

The method consists of plating steel (0.26–1.5 per cent carbon and hardenable alloys) with nickel, heating to 1450-1650° F, cooling, and tempering to (1) intimately bond the nickel which is then substantially free of embrittlement, (2) harden the steel and (3) develop the desired physical properties in the steel.

4 claims, figure.

—AES—

No. 2,731,408, January 17, 1956—Electrolytically Conductive Membranes—J. Clarke, assignor to Sonics, Incorporated, Cambridge, Mass.

A copolymer of divinyl benzene and olefinic carboxylic acids, anhydrides, etc. is claimed as a cation permeable solid barrier which when used to separate two solutions and upon the impressment of direct current causes the migration of the cations from one solution to the other.

12 claims, figure.

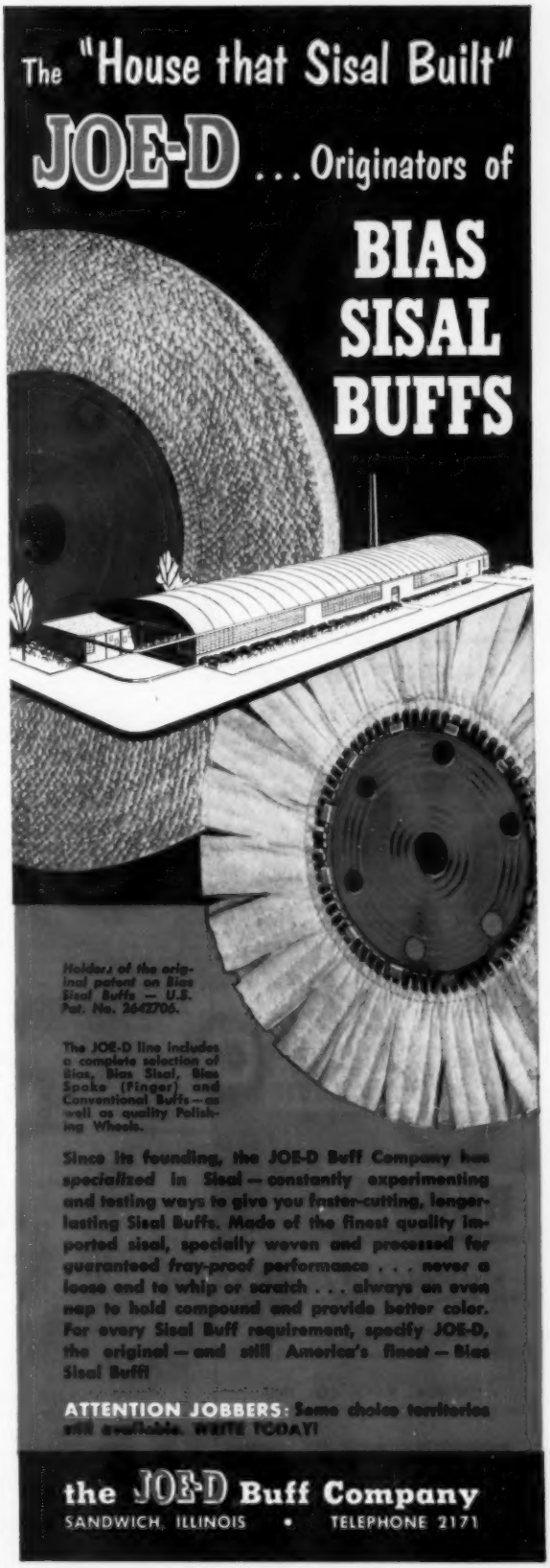
See also No. 2,731,411 by same inventor.—15 claims.

—AES—

No. 2,732,339, January 24, 1956—Electrolytic Fused Salt Cleaning Bath—H. Graham and R. Thomas, assignors to J. H. Shoemaker, Detroit, Mich.

The construction features of equipment for electrolytically treating metals in a molten salt bath are described. The bath referred to contains sodium hydroxide, sodium chloride, and sodium aluminate, with or without sodium fluoride as described in U.S. patent No. 2,515,148.

2 claims, 5 figures.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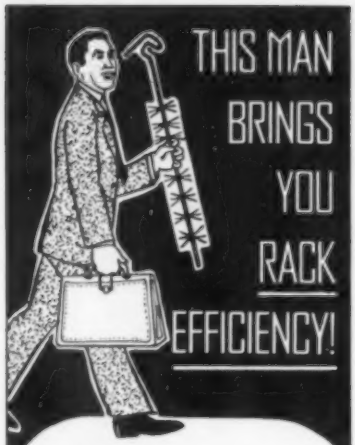

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ARTICLE REFERENCES

By
WILLIAM TUCKER
Eastman Kodak
Rochester, N.Y.

Most of the articles listed here may be obtained by writing to the Publication. Addresses are included for the reader's convenience.

64. ANALYSIS

a. *BORIC ACID ANALYSIS IN NICKEL SOLUTIONS*
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65. ANODISING

a. *BRUSH ANODISING: A PROCESS OF ANODISING AVOIDING IMMERSION IN A TANK*
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66. BLACKENING

a. *BLACK FINISH WITH A BRIGHT FUTURE*
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67. CHROMIUM

a. *CHROMIUM PLATING ROCKET MOTORS*
Steel, Vol. 138, January 16, 1956, p. 74

b. *CHROMIUM PLATING ON TIN-BASE DIE CASTINGS*
Tin and Its Uses, January 1956, No. 34, p. 4

68. CORROSION

a. *RESISTANCE OF MATERIALS TO MECHANICAL CORROSION*
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Product Engineering, Vol. 27, January 1956, p. 194–197

b. *CHARACTERISTICS AND PREVENTION OF FRETTING CORROSION*
R. B. Waterhouse
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c. *NAVY EXPERIMENTAL WORK WITH CATHODIC PROTECTION*
Irving D. Gessow
Corrosion, Vol. 12, No. 3, March 1956, p. 18–24

d. *THE ROLE OF NICKEL AND NICKEL SUBSTITUTES IN JEWELRY MAKING*
E. H. Mairs and J. M. Williams
Corrosion, Vol. 12, No. 3, March 1956, p. 31–36

e. *OXIDE FILMS ON STAINLESS STEELS*
Thor N. Rhodin
Corrosion, Vol. 12, No. 1, March 1956, p. 41–52

69. COSTS

EXCESS JOB SHOP COSTS RECORDED, CONTROLLED AND REDUCED
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70. DESCALING

a. *THE SODIUM HYDRIDE PROCESS FOR DESCALING METALS*
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71. ELECTROFORMING

a. *SOME TIPS ON ELECTROFORMING* (Part I)
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Metal Finishing, Vol. 54, No. 3, March 1956, p. 56–59

72. ELECTROLESS PLATING

a. *PEEN PLATING. NEW ELECTROLESS PLATING METHOD*
Corrosion Technology, Vol. 3, No. 2, p. 46
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73. ELECTROPHORETIC COATINGS

a. *DEPOSITION OF COATINGS BY ELECTROPHORESIS*
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74. HYDROGEN DIFFUSION

a. *MECHANISMS OF HYDROGEN PRODUCING REACTIONS ON PALLADIUM. II. DIFFUSION OF ELECTROLYTIC HYDROGEN THROUGH PALLADIUM*
Sigmund Schuldiner and James P. Hoare
Journal of the Electrochemical Society, Vol. 103, No. 3, p. 178–181

75. LEVELING

a. *LEVELLING IN BRIGHT NICKEL PLATING SOLUTIONS*
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Electroplating and Metal Finishing, Vol. 9, No. 2, February 1956, p. 39–43

76. NICKEL

a. *PLATING PIT-FREE, HEAVY NICKEL*
Paul H. Margulies
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77. ORGANIC

a. *AUTOMATIC ELECTROSTATIC SPRAYING. GIVES BETTER UNIFORMITY OF GROUND COAT*
Automotive Industries, Vol. 114, January 15, 1956, p. 65.

b. *PREPARATION AND PROPERTIES OF POLYURETHANE COATINGS*
Charles B. Reilly and Milton Orchin
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78. **SILVER PLATING**
a. *SILVER PLATING BERYLLIUM COPPER*
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79. **SOLDERING**
a. *SOLDERING AND PRINTED CIRCUITS*
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80. **SUPERVISION**
a. *THE BRAND-NEW SUPERVISOR*
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81. **THICKNESS**
a. *PLATING THICKNESS BY THE ATTENUATION OF CHARACTERISTIC X-RAYS*
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Journal of the Electrochemical Society, Vol. 103, No. 3, March 1956, p. 157–159

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DEAR SIRS:

We wish to thank you most kindly for permission granted us in the latter part of last year to discuss the feasibility of applying ultrasonics to the electroplating industry.

While we have available several types of ultrasonic equipment of various capacities, we are sure you will agree that there is much to be done before ultrasonics will be used on a large scale for improving electroplating processes. The amount of energy applied, its distribution and many other variables can only be determined by a jointly guided research program.

In the survey we recently made, we found so much interest in this problem that we are proposing to develop equipment particularly designed for laboratory research in electroplating. Obviously, the design of the equipment must be such that repetition of results may be obtained and variables, quantitative and qualitative, determined. The equipment will consist of an aplifier which we have already constructed and which is illustrated on Page 2 of the attached report from "The American Machinist."

The treatment tank is one point that requires special consideration. It has been suggested that this be made in the form of a Hull cell. It has also been suggested that the Hull cell would not represent actual plating conditions and that a rectangular treatment tank would be preferable, permitting the use of serpentine forms to more adequately show throwing power, burning and the effect of disturbing concentration gradients. Possibly both types should be provided.

We would appreciate your thinking as to your possible requirements in this regard, with the understanding that no commitments would be made whatsoever.

This letter is being forwarded to various outstanding people in the electroplating industry with two main purposes in mind, firstly, to insure that the development of this equipment will be most useful for its purpose and, secondly, to obtain sufficient interest and participation in this development so that no one party interested, including ourselves, would be faced with a prohibitively expensive program. With sufficient parties interested, the equipment development cost would be small indeed.

Very truly yours,
Murdoch Laboratories
Port Washington, N. Y.
Alexander Murdoch, Jr.

(PLATING readers may write directly to Mr. Murdoch if they are interested in this matter—Ed.)

DEAR SIRS:

May I take the liberty of calling your attention to the fact that a symposium on Electroplating Practices, similar to the one delivered at the Buffalo meeting will be held at the September Second Pacific Area National meeting of our society, with a couple of additions as outlined in the Program attached. In addition, there will be a very interesting paper delivered under the auspices of Committee D 19 "Industrial Waters" of the title "New Methods for Handling Plating Room Wastes."

All members of the AES are cordially invited to attend these meetings without any charge or registration fee, provided they show their AES membership cards and do not request prints of the respective papers.

This information was already made by President E. W. Arnold at a recent meeting of the local branch of the AES. However, as the Second Area National Meeting of ASTM is covering the entire West Coast, it would be appreciated if your Society would notify the San Francisco section and any other electroplating groups associated with you at Portland, Seattle and San Diego. If anybody from out of town desires additional information, kindly advise him to contact the undersigned, and please take note of my new address: 255 Via La Circula, Redondo Beach, Calif.

Thank you in advance,
Sincerely yours
P. James Rich, Ph.D.
Chairman, Technical Program Committee.

(Publicity regarding the symposium will appear in the June, Aug. and Sept. issues of PLATING—Ed.)

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INTERSOCIETY NEWS

An Aisle at the 1956 Corrosion Show held concurrently with the 12th Annual Conference of the National Association of Corrosion Engineers at Hotel Statler, N. Y., March 12–16.

NACE 12th Annual Conference and Corrosion Show

Corrosion engineers are showing increased interest in plating as a means of controlling corrosion in industrial plants. At least two of the exhibitors at the Corrosion Show, held concurrently with the 12th Annual Conference of the National Association of Corrosion Engineers at Hotel Statler, New York, featured plated equipment. The NACE conference was held March 12–16.

The conference, which featured some 70 technical papers at 14 symposia and more than 60 meetings of technical committees, attracted more than 1800 paid registrants. Total registered attendance was 2690.

Technical material covered a wide variety of subjects, including chemical inhibitors, refinery industry, high purity water, oil and gas production, steel metallurgy, chemical industry and others. Four papers by foreign authors were presented.

Among the technical committees meeting were those interested in the chemical manufacturing industry, sulfuric acid, acetic acid, chlorine, nitric acid, hydrofluoric acid, high temperature corrosion, stress corrosion cracking of austenitic stainless steels, and glass linings and vitreous enamels.

Taking office on the last day of the conference were new officers, W. F. Fair, Jr., Koppers Company, Pittsburgh, president and W. H. Stewart, Sun Pipe Line Co., Beaumont, Texas, vice-president. R. A. Brannon, Humble Pipe Line Co., Houston was reelected treasurer. New directors taking office were H. L. Bilhartz, Production Profits, Inc., Dallas; Hugh L. Hamilton, The A. V. Smith Engineering Co., Narberth, Pa. and A. L. Stegner, Tennessee Gas Transmission Co., Houston.

Norman Hackerman, chairman of the chemistry department at University of Texas, Austin, received the 1956 Whitney Award for achievements in corrosion science. Mars G. Fontana, professor of metallurgical engineering, Ohio State University, Columbus, received the Speller Award for achievements in corrosion engineering. Edward L. Simons, General Electric Research Laboratory, Schenectady, N. Y. received the 1955 award for authors under 35 for publication of the most meritorious paper in the NACE magazine *Corrosion* during that year. All awards were made at the annual banquet, March 14.

IMS Sponsors Management Clinic

The 20th Anniversary National Time and Motion Study and Management Clinic sponsored by the Industrial Management Society will be held on October 31, November 1–2, at the Sherman Hotel, Chicago. More than 2000 industrial engineers, works managers, plant superintendents, and production executives are expected to attend the technical sessions, and industrial exhibits.

ASTM to Hold Extensive Technical Program and Apparatus Exhibit

A variety of subjects relating to research and testing of engineering materials will be discussed at the 59th Annual Meeting of the American Society for Testing Materials to be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 17–22. A total of 31 sessions are now scheduled beginning on Monday morning and continuing until Friday noon. Eight symposiums are scheduled on the following subjects: Specific Gravity of Bituminous Coated Aggregates, Ion-Exchange and Chromatography in Analytical Chemistry, Solder, pH Measurement, Tension Testing of Non-Metallic Materials, Steam Quality, Rheology, and In-Place Shear Testing of Foundation Soil by the Vane Method. In addition, sessions are scheduled at which individual papers will be given on the subjects of metals, concrete, fatigue, stainless steel, soils, and general testing.

Important on each year's program are two lectures, the Edgar Marburg Lecture and the Gillett Memorial Lecture. The Marburg Lecture this year will be given by Dr. Charles E. Reed, general manager, Silicone Products Dept., General Electric Co., Waterford, N. Y., on "The Chemical Properties, and Applications of Silicones." Dr. D. K. Crampton, director of development, Chase Brass and Copper Co., Waterbury, Conn. will give the Gillett Memorial Lecture on "Structural Chemistry and Metallurgy of Copper."

The Society's 12th Exhibit of Testing and Scientific Apparatus and Laboratory Supplies will be an outstanding attraction. At this Exhibit, held every other year, the latest in research and testing apparatus will be displayed by the country's leading manufacturers. Hundreds of items from small hand-manipulated instruments through electronic control devices and high temperature ovens to universal testing machines will be exhibited.

Important in the Society's activities are the large number of technical committee meetings which are scheduled. About 50 committees and their subcommittees will hold about 500 meetings.

The president's address, the introduction of new officers, recognition of 40- and 50-year members, and awards of merit will be made at a luncheon session at noon on Tuesday June 19.

On Wednesday evening, June 20, the annual dinner will provide a "break" in a week otherwise devoted to intensive technical activity. Entertainment will be provided after the dinner by the Philadelphia District Council, host for the meeting. The Council is also planning an attractive program of ladies entertainment for the many wives who will accompany their husbands to Atlantic City.

ASQC Expects 2000 in Montreal

The Montreal Host Committee for the 10th Annual Convention of the American Society for Quality Control has recently released the convention highlights for the forthcoming convention to be held in Montreal, Canada, June 6, 7, 8, 1956.

Over 2000 delegates are expected to attend the 3-day convention to be held at Le Palais du Commerce (the Show-Mart).

More than ninety speakers from the United States, Canada and Europe will talk on all phases of quality control, industrial statistics and operational research. Among the industries to be covered are chemical, metallurgical, food processing, aircraft, automotive, brewing, pulp and paper etc. There will be interesting papers on the application of statistical techniques to accounting and business administration. A number of papers will be delivered in the French language.

McMillen Elected ASTE President

Howard C. McMillen, Bedford, Indiana, has been elected president of the 33,000-member American Society of Tool Engineers to succeed Dr. Harry B. Osborn, Jr., of Cleveland, Ohio. McMillen is plant manager of Philco Corporation's Bedford, Indiana plant. Osborn is technical director of TOCCO Division, Ohio Crankshaft Company.

Other society officers elected are: H. E. Collins, manager, Process Engineering Department, Hughes Tool Company, Houston, Texas, first vice-president; G. A. Goodwin, chief process engineer, The Master Electric Company, Dayton, Ohio, second vice-president; Wayne Ewing, president Arrowsmith Tool and Die Co., Inc., Los Angeles, California, third vice-president; H. Dale Long, president, Scully-Jones & Company, Chicago, fourth vice-president; John X. Ryneska, manager of purchasing; General Electric Company, West Lynn, Mass., treasurer; and William Moreland, vice president, Meyers Pump Co., Ashland, Ohio, secretary.

Design Engineers Prepare to Gather in Philadelphia

More than 12,000 visitors, representing every major industry, are expected to see exhibits valued at $2,000,000 at the first Design Engineering Show May 14–17, at Convention Hall, Philadelphia.

The engineers, responsible for designing products used in the home and by industry, will see thousands of components and materials which go into the making of end products. The exposition, expected to have far-reaching effects on all types of products, represents the first time design engineers in one industry will be able to see under one roof the design developments of all other industries.

To accompany the exhibits, the machine design division of the American Society of Mechanical Engineers will sponsor a four-day conference on design engineering.

On display will be electrical and mechanical components, metallic and non-metallic materials, fasteners, finishes and coatings, hydraulic and pneumatic components, shapes and forms, and accessories.

Topics at the conference will include cost reduction through product design, finding and training design engineers, selecting materials, problems arising from the trend toward miniaturization, rewards for employee inventions, and legal rights of employees in inventions.

Dever Reelected by SAMA

Henry F. Dever was reelected president of the Scientific Apparatus Makers Association at the Association's recent annual meeting.

Dever, president, Brown Instruments Division, Minneapolis Honeywell Regulator Company, Philadelphia, has been SAMA president the past year.

R. E. Welch, vice-president and treasurer, W. M. Welch Manufacturing Company, Chicago, remains as SAMA president pro tempore.

T. M. Mints, president, E. H. Sargent & Company, Chicago, continues as SAMA treasurer.

Second Production Machine Tool Hydraulic Forum

The 1956 Production Machine Tool Hydraulic Forum has been scheduled for May 24 and 25 at the Engineering Society of Detroit Building in Detroit, Michigan. This is the second forum for the Machine Tool Industry to be sponsored by Vickers Incorporated. Its purpose is to promote further improvement in hydraulic components and systems through an open exchange of information on current problems.

The president of the National Machine Tool Builders' Association, Louis F. Polk, will be the keynote speaker for the 1956 Forum. Polk is president of The Sheffield Corporation. Co-moderators for the two-day event are to be Hans Ernst, director of research at Cincinnati Milling Machine Company, and Russell L. Dustman, productive equipment manager for Chevrolet Division of G.M.C.

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MEET MR. PRESIDENT

P. Tikotin—now aged 35 years—joined the Melbourne Branch in 1949; and, after serving on various sub-committees, became Vice-President in 1954 and President in 1955.

After matriculating at London University in 1937 from Ryde School, Ryde, Isle of Wight, England, he joined Vidor Limited, London, as junior technician in their Television Laboratory. Migrating to Australia shortly before the war, he served a brief period in the Australian Army and was then discharged for duty as inspector of radio equipment with a number of Melbourne Electronics Manufacturers. At the end of the war he became a partner in a radio and electrical business. He later sold his interest and joined the staff of McKenzie & Holland (Australia) Pty. Ltd. as sales engineer for the Westinghouse Metal Rectifier Division. He has taken a particular interest in the application of rectifiers for the plating industry and this has led to his close association with the AES.

Tikotin
Melbourne Branch

What spare time he has after his family and official duties and the part-time lecturership which he holds, he devotes to his garden and to reading of the older English literary classics of which he is a student. He is also a keen chess player.

Simon P. Gary, Jr. was born May 15, 1919 at Oak Park, Ill. He attended Grammar and High School at Oak Park, Ill.; College—Rose Polytechnic Institute at Terre Haute, Ind., receiving his BS in Chemical Engineering in 1941.

Gary
Chicago Branch

Simon started in the plating field at Allison Division of General Motors Corp. at Indianapolis in 1942 as a laboratory technician. This work was concerned primarily with heavy silver plating of aircraft engine bearings, although almost every type of plating was encountered. From there, he went to Plastic Platers as a development engineer. This company was one of the pioneers in the field of plated plastics and printed circuits. Then, he moved to Scientific Control Laboratories, consultants to the electroplating industry, as a chemical engineer. This led to his present position as manager of the Hard Chrome Div., Grunwald Plating Company. There the specialty is mechanically chrome plating nuts and bolts as well as hard chrome plating anything they can get in hand.

Simon's wife is named Betty; their three daughters are Cheryl E. 10 years, Marilyn Jean 9 years and Karen Sue 5 years old. Simon says these three girls are the finest in the land.

Although Gary says his hobbies are loafing, fishing, bridge and pinochle, he was, until last year, active in six professional societies. This activity he has whittled down to the Electrochemical Society and the AES. He was Chairman of the Chicago Branch of the Electrochemical Society in 1952.

AES MEMBERSHIP REPORT

ELECTIONS

Bridgeport: Carl Annecharico, H. J. Honez, M. J. Sondej
Buffalo: C. N. Wagonblott
Central Michigan: M. N. Little, D. F. McDonald
Chicago: J. K. Douglas, A. K. Nelson
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Hartford: G. Gardner, F. Rawley, I. M. Wolfson
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Melbourne: N. F. Herbst, J. N. Lynch
Montreal: J. A. Bluch, C. D. Crerar, S. W. Hishon, J. A. Kidd, P. Laviolette
New York: S. Ader, G. Borello, J. J. Carrona, I. Fowler, J. Hughes, I. Wexler
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Saginaw Valley: G. A. McBride, R. A. West
St. Joseph Valley: J. F. Devendorf, G. E. Shuman, A. P. Strickler
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Detroit: B. B. Davis, M. A. Parker
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New York: P. Stevens (suspended in error)
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Toronto: J. A. Byers

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Baltimore-Washington: T. Katan
Chicago: H. Bach, T. Balkouis, L. Basco, J. Bognar, R. L. Clark, M. J. Collins, R. Collurafici, C. J. Crescio, A. J. D'Anna, B. D'Anna, J. A. Deibel, H. Deyne, J. Deyne, A. Doran, J. C. Duke, V. Farr, E. D. Fontaine, J. J. Galanti, L. R. Gallas, J. Havlik, J. P. Hitter, L. A. Humphrey, G. F. Kersten, F. H. Kletka, H. Kob, E. Kogut, T. Kolar, H. Krueger, M. Lieberman, J. Miller, R. E. Miller, P. F. Morley, W. M. Neuckranz, C. P. Olsen (in armed forces), R. W. O'Neal, J. H. Oxley, A. R. Parker, J. J. Perry, S. Pestone, A. L. Pietrowicz, J. Raby, T. Reinewald, E. Setlik, W. K. Sticksel, J. G. Templin, R. E. Towner, D. V. Trapp, M. Tychman, E. H. Ward, C. Westerguard, T. M. Witte, W. Yeoman, R. J. Young, W. A. Zube
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Syracuse: S. W. Aker, J. H. Bowers, G. Jones, M. D. Lameron, G. Rubal, M. Rubycz

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Philadelphia: A. Hirsch, H. G. Orlik
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ABSTRACTS OF PAPERS

FIRST EDUCATIONAL SESSION — MONDAY, JUNE 18

(SESSION A)

Chairman: E. R. Bowerman, Jr., Sylvania Electric Products, Inc.

SOME RECENT DEVELOPMENTS IN SELECTIVE, LOCALIZED PLATING FOR ENGINEERING PURPOSES

by Marv Rubinstein
Metal Finishing Consultant

The operation formerly known as "brush" or "touch-up" plating has recently undergone a complete revolution. Primarily the paper covers techniques of operations including a description of a variety of engineering applications. The metallurgical properties of deposits obtained by such methods also receive some attention.

INVESTIGATION AND EVALUATION OF PLATING PROCESSES AND PLATING COMBINATIONS FOR USE ON ETCHED CIRCUITRY

by
E. H. Babcock, R. K. Stephens, R. C. Grimsinger, Convair, Division of General Dynamics Corp.

This work covers the various processes, plating baths, and plate combinations proposed for use on etched circuitry fabricated from one and two side copper laminate glass epoxy board.

OVERLAY PLATING OF STEEL-BACK ALUMINUM-LINED SLEEVE BEARINGS

by
A. H. Beebe, Jr., B. G. Rothschild and G. J. LeBrasse, Federal-Mogul Division, Research and Development, Federal-Mogul-Bower Bearing, Inc.

One of the newer products in the sleeve bearing industry is the steel back—aluminum alloy lined bearing. This paper describes a method for electrodepositing a lead alloy overlay on such bearings.

THE PROTECTION OF MOLYBDENUM AGAINST HIGH TEMPERATURE OXIDATION

by
Julius J. Harwood, Head Metallurgy Branch, Office of Naval Research, Navy Department

This paper reviews the status of the problem of the oxidation of molybdenum and attempts to summarize the research programs which have been underway for the development of protective coatings.

(SESSION B)

Chairman: Dr. R. B. Saltonstall, The Udylite Corporation

GAGING THIN NICKEL COATINGS BY X-RAY FLUORESCENCE

by
K. G. Carroll and W. W. Sellers
International Nickel Company, Inc.
Research Laboratory

Electrodeposited nickel coatings ranging in thickness from 10 to 200 microinches may be accurately measured by means of characteristic X-rays generated in the coating. Suitable X-ray apparatus is described, and optimum conditions for X-ray excitation, dispersion, and detection are discussed. The non-destructive character of the measurements is important in many plating applications.

COATING THICKNESS MEASUREMENT BY FILTERED X-RAY FLUORESCENCE

by
Dr. Earl J. Serfass and Dr. Fred A. Achey
Department of Chemistry
Lehigh University

Using X-ray fluorescence methods, thickness of thin coatings can be determined by measuring either excitation of the substrate or the coating layer. The use of filters to measure characteristic X-ray fluorescence radiation is suggested as a method for quantitatively determining the thickness of thin coatings. The method involves excitation of both the coating and substrate with an incident X-ray beam, and subsequent measurement of only fluorescence from the coating. Easily prepared filters replace the usual collimator-crystal procedures.

A Timely Message on

Automation

by Ben P. Sax

President, American Buff Company

It seems a safe prediction that, one day, automation will be an everyday routine in our lives. We'll have to rack our memories—twenty-five or fifty years from now—just to recall what all the shouting was about. And I am confident we will be rather amused at the suspicion which automation initially aroused in some quarters.

Eventually, the "spectre" of automation will be likened to the first threat of steam power.

If I recall my economic history correctly, the Industrial Revolution of the early 1800's was a truly disrupting process. And, aside from the economic adjustments required, people were really frightened by the steaming, smoking mechanical monsters it spawned.

However, the seeming "monsters" soon proved to be quite gentle. And power driven machines—steam, electric, gasoline and oil—became amazingly beneficial, collectively and individually. Child labor disappeared. The working day became much shorter. Wages went up. And, with increasing production, prices went down as overall sales volume went up.

Fortunately for our young country, the Industrial Revolution proved to be the vehicle (together with the "Horseless Carriage") for the American way of life and the American system of free enterprise.

With this steadying and impressive "pilot operation" to look back on, I look forward with keen interest to the use of automation in industry. The resulting "revolution" will undoubtedly be smoother, more gradual than the introduction of machines at the start of the century. Most important, automation could well be another great advance for our American way of life . . . and for the world.

Sincerely,

Ben P. Sax

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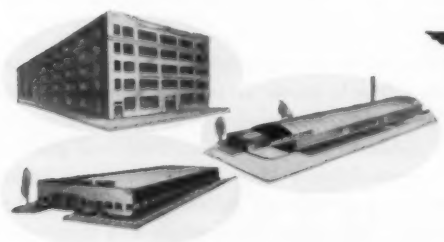

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(SESSION B)

CURRENT DISTRIBUTION OF MICROPROFILES
by
Dr. D. Gardner Foulke and
Dr. Otto Kardos
Hanson-Van Winkle-Munning Company

The characteristic dimensions of microprofiles are relatively small with respect to: (1) The product of the specific conductivity and the slope of the polarization curve. (2) The "effective thickness" of the diffusion layer. Criterion 1 alone would lead to uniform current distribution on microprofiles under most conditions. Criterion 2, however, serves to explain both leveling and microthrow as it implies that the "effective thickness" of the diffusion layer is smaller for the peak than for the recess. New experimental data are presented.

LEVELING—DEFINITION, MEASUREMENT, AND UNDERSTANDING
by
J. D. Thomas
General Motors Corp.

Leveling is defined. The bases for plating are electroforms of standard ruled specimens in which the spacing, depth, and angle of rulings were varied in a controlled manner. The degree of leveling on the plated samples was studied by means of the Surfagage, Tallysurf, interference microscope, and by cross-sectioning. Experimental data show that organic addition agent combinations primarily, influence the leveling characteristics of bright nickel plating baths. Possible explanations of the mechanism of leveling are discussed.

SECOND EDUCATIONAL SESSION — TUESDAY, JUNE 19

(SESSION A)

Chairman: J. Teres, Wright Air Development Center

PROPERTIES OF ELECTRODEPOSITS AT ELEVATED TEMPERATURES
by
W. H. Safranek and G. R. Schaer
Battelle Memorial Institute

Elevated temperature properties including oxidation resistance in air and molybdenum oxide, stress rupture, thermal expansion, thermal stability, ductility, and hot hardness were determined for nickel, chromium, and other electrodeposits. The results of the research showed promising leads for developing improved electrodeposits for protecting molybdenum and other metals against oxidation at high temperatures.

LIMITATIONS OF PLATED NICKEL IN JET ENGINE DESIGN
by
R. W. Moeller and W. A. Snell
Pratt and Whitney Aircraft

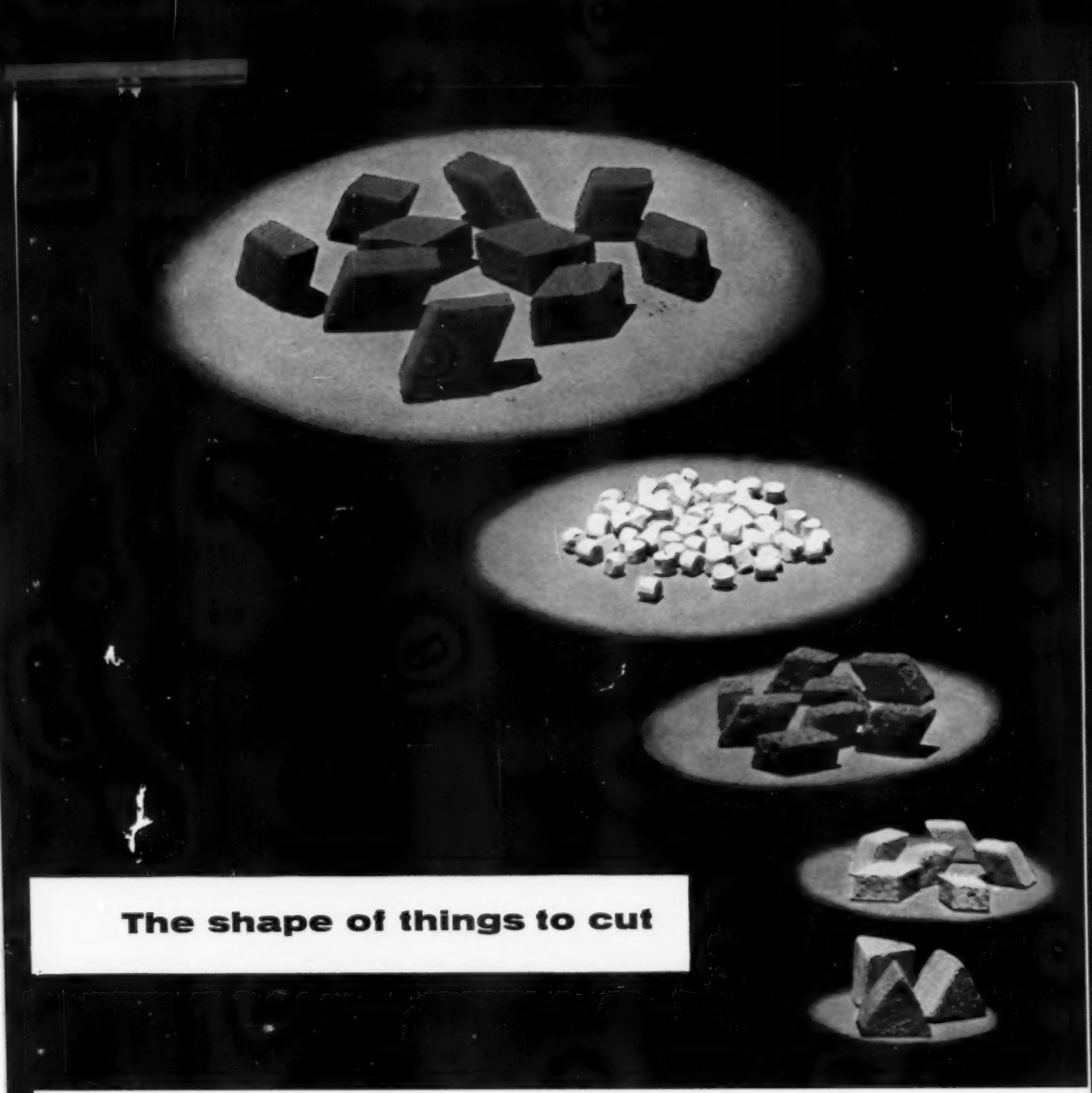
This paper presents in graphic form some of the factors which restrict the use of plated nickel on highly stressed jet engine parts. Residual stress vs. temperature, residual stress vs. fatigue life, plate thickness vs. corrosion resistance and production control variations are discussed, showing the limitations of nickel plated from the Watts' type, sulfamate, and electroless nickel solutions.

SOME CHARACTERISTICS OF ELECTROFORMED IRON DEPOSITS
by
Dr. A. M. Max
RCA Victor Record Division
and
Dr. G. R. Van Houten
P. R. Mallory and Co.

Deposits from a typical iron chloride electroforming solution are investigated under a wide variety of deposition and solution variables. Cathode efficiency, deposit stress, tensile strength, and ductility as well as pitting are correlated with temperature, current density, acidity, ferric ion concentration and agitation. The importance of temperature is demonstrated and related to deposit stress.

A STUDY OF THE EFFECT OF SEVERAL ORGANIC ADDITION AGENTS ON THE HARDNESS AND RESIDUAL STRESS IN NICKEL DEPOSITS
by
I. L. Newell
Henry Souther Engineering Co.

No hard and ductile metals are available as electrodeposited coatings with low residual tensile stress or compressive stress. The sulfamate formulation for Ni deposits was chosen to be modified with several organic addition agents to increase the hardness and produce a compressively stressed electrodeposit. Three organic addition agents were chosen for test: saccharin, paratoluene sulfonamide and naphthalene 1, 3, 6 trisulfonic acid. The results obtained show a correlation between the temperature, current density, stress and hardness with varying amounts of the addition agent.



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Chairman: Dr. Earl J. Serfass, Lehigh University

In the control of brightener additions to cadmium plating solutions it is important to determine the amount of nickel present in the bath. The relatively small amounts of nickel make the use of spectrochemical techniques attractive for speed, convenience, and accuracy. This paper describes the method selected and includes experimental data and analytical curves. A procedure for the preparation of standards is given.

A brief review of polarographic methods used, to date, in cyanide zinc plating bath analyses is given. A method developed as a part of a general study undertaken in the authors' laboratory is described. This new polarograph, based upon certain assumptions and using a modified, simpler and less expensive polarographic circuit, makes possible the determination of zinc, total sodium cyanide, caustic soda, and sodium carbonate.

A new type of electroplating cell, the "Hyperbolic Electroplating Cell" was developed. The hyperbolic cell was designed and constructed to conform to a predetermined geometrical pattern. Cell calibration curves were experimentally developed which help to establish a simple mathematical formula expresing the linear relationship between primary current density and distance measured along the cathode of the cell.

The development of a simple procedure for analyzing plating baths is described. The analysis can be carried out in the plating shop within 10 minutes. The apparatus necessary for the analysis can be constructed by any machine shop and can be calibrated in the plating shop. The required reagents are generally available in the plating shop or can be purchased locally; furthermore, the concentrations of the reagents used in the analysis are not critical.

A rapid polarographic method for the determination of cadmium and total cyanide in cadmium plating solutions is presented. Both cadmium and total cyanide can be determined in 10 to 15 minutes. Data comparing results obtained using the method described and a conventional method of analysis is given together with the required calibration curves and a sample polarogram.

THIRD EDUCATIONAL SESSION

Chairman: L. F. Scott, United Chromium Corp.

A motion picture designed to show advantages offered by coated abrasive belts, their adaptability, and available machinery for mass production finishing.

The object of this paper is to collect and classify available information on filter media and present it as an aid in the selection of filter media for specific uses.

(SESSION B)

SPECTROCHEMICAL DETERMINATION OF NICKEL IN BRIGHT CADMIUM PLATING SOLUTIONS
by
Henry R. Friedberg
Metal Finishing Consultant
Morton L. Levy
Laboratory Manager
Crobaugh Laboratories

COMPLETE POLAROGRAPHIC ANALYSIS OF CYANIDE ZINC PLATING BATHS
by
T. H. Collard, Jr. and David K. H. Liu
Friedrich Refrigerators, Inc.

CONSTRUCTION AND OPERATING CHARACTERISTICS OF A NEW ELECTROPLATING CELL FOR CURRENT DENSITY STUDIES
by
R. F. Walton
Radio Corporation of America
R. Gilmont
Manostat Corporation

RAPID ANALYSIS OF CYANIDE PLATING BATHS
by
Dr. R. F. Muraca
Jet Propulsion Laboratories
California Institute of Technology

THE POLARAGRAPHIC DETERMINATION OF CADMIUM AND CYANIDE IN ALKALINE CADMIUM PLATING SOLUTIONS
by
G. T. Forsyth
The Udylite Research Corp.

TUESDAY, JUNE 19

(SESSION A)

COATED ABRASIVE BELTS SPEED METAL WORKING PRODUCTION
by
E. E. Oathoat
Behr-Manning Coated Abrasives Div.
of The Norton Company

FILTER MEDIA
by
Q. O. Shockley, M. L. Whitehurst,
Elmer Lundberg, John Hood
Indianapolis Branch,
American Electroplaters' Society

TANK LININGS
by
Kenneth G. Le Fevre
Metalweld, Inc.

The paper begins with a general discussion of the lining and coating materials that have been used in pickling and plating tanks. Various coating and lining materials are covered including the more recent "Combination Coatings". Insofar as possible, the economics of various types, along with practical considerations such as repairs are discussed. Case studies are presented.

PLATING ROOM TANK VENTILATION EQUIPMENT
by
F. W. Arndt, Chief Engineer
Heil Process Equipment Corp.

A brief discussion of the most important considerations for determining the exhaust volumes required for the various typical plating tanks is presented. With this as a basis, the paper is divided into five topics each being discussed mostly from a practical viewpoint: A) Hoods, B) Ducts, C) Fans, D) Fume Scrubbers, E) Stacks.

(SESSION B)

Chairman: C. H. Sample, International Nickel Co.

THE RADIOGRAPHIC DETECTION OF PORES IN PLATED COATINGS
by
Fielding Ogburn and Margaret Hilkert
National Bureau of Standards

Techniques for making radiographs of metal coatings plated adherently on steel or on a radioactive basis metal are described. Either a radioactive metal or an X-ray machine may be used as the radiation source. Means of greatly improving sensitivity by use of microradiography are indicated.

THE PERMEATION OF GASES THROUGH ELECTROLYTIC NICKEL DEPOSITS AS AFFECTED BY ACCELERATED CORROSION
by
Dr. J. Martin Tobin, General Electric Corp. and Dr. D. Gardner Foulke
Hanson-Van Winkle-Munning Company

The method for measuring the permeability of electrolytic nickel foils to gases and the "intrinsic" permeability of various nickel deposits as well as wrought nickel are discussed. Data on the initial permeability of nickel-chromium foils is reported. Induced permeability after corrosion in 10 per cent sulfuric acid is also reported as are the results of a study of effect of electrolytic corrosion, according to the Pinner-Pierce method.

EFFECT OF IMPURITIES AND PURIFICATION OF ELECTROPLATING SOLUTIONS I. NICKEL SOLUTIONS
9. The Effects and Removal of Aluminum
(AES Project 5)
by
Dr. D. T. Ewing and Dr. A. J. Smith
Michigan State University
and
Dr. W. O. Dow, Jr.
Sunbeam Corporation

The effects of aluminum on the appearance, adhesion, ductility, salt spray corrosion resistance, hardness and throwing power on electrodeposited nickel were studied. Low and high pH Watts solutions were studied for effects on spray nickel deposits, organic and nickel-cobalt solutions for bright deposits.

EFFECT OF IMPURITIES AND PURIFICATION OF ELECTROPLATING SOLUTIONS I. NICKEL SOLUTIONS
10. The Effects and Removal of Manganese
by
Dr. A. J. Smith, Michigan State University
and
Dr. R. J. Rowe, Dow Chemical Co.

The effects of manganese in solution in the physical properties of electrodeposited nickel were studied. As in previous work solutions employed were 2.2 and 5.2 pH Watts organic, and nickel-cobalt. Concentrations up to 300 mg/l showed no significant effect on any of the properties. Removal of manganese cannot be effected by either low current density electrolysis or high pH treatments.

PROGRESS REPORT ON ACCELERATED CORROSION TESTS FOR THE PERFORMANCE OF PLATED COATINGS
(AES Project 15)
by
Dr. W. L. Pinner
Houdaille Industries, Inc.

The third report of the Project 15 Committee accounts for continuing work in an endeavor to produce a dependable reproducible corrosion test for plated coatings. The report considers in detail the intensified effort which has been expended on two tests selected from those listed in the last report and which give promise of being successful in their application.

FOURTH EDUCATIONAL SESSION

Chairman: Dr. W. A. Wesley, International Nickel Co.

WEDNESDAY, JUNE 20

(SESSION A)

ELECTRODEPOSITION OF POROUS NICKEL-CADMIUM ALLOY

by
L. D. McGraw, J. P. Spenard,
and
Dr. C. L. Faust
Battelle Memorial Institute

Porous nickel-cadmium alloy plate was deposited from a sulfate-chloride bath. Porosity as high as 30 to 50 per cent was induced by a colloidal addition agent. Gelatin was added to control stress and nodulation up to thickness of about 0.015 inch. Plate composition could be controlled up to 5 per cent cadmium.

GOLD-SILVER ALLOY PLATING

by
R. E. Harr and A. G. Cafferty
Western Electric Co., Inc.

This report covers investigations of gold silver alloy plating from a cyanide type solution. The investigation was conducted to develop a set of conditions which would produce an 8 per cent silver gold alloy and several sets of conditions which yield such an alloy are given.

NICKEL-IRON ALLOY DEPOSITS FOR MAGNETIC SHIELDING

by
V. P. McConnell and Dr. I. W. Wolf
General Electric Co.

This paper covers the development of nickel-iron deposits to obtain thicknesses of plate from .003 inch to .025 inch. The effects of metal ion concentration and the conditions necessary to arrive at a deposit of the greatest initial permeability are listed. The effects of organic addition agents to reduce brittleness are also covered.

IMPROVED TECHNIQUES FOR ELECTROLESS NICKEL PLATING ON NON-CONDUCTORS

by
Dr. Harold Narcus
President and Technical Director
Electrochemical Industries, Inc.

This paper describes new and improved techniques for depositing electroless nickel coatings on non-conductors specifically ceramics, glass and plastics. More rapid and complete coverage of the non-conductive surface and greater adhesion of the nickel deposit to that surface result from employment of "de-polarizing", "sensitizing" and "activating" techniques which have been evaluated fully in many diversified industries.

Chairman: G. A. Lux, Oakite Products, Inc.

(SESSION B)

STUDY OF PHOSPHATE TREATMENTS FOR METALS

by
Lloyd Gilbert
Rock Island Arsenal

This paper covers the actual formulation of the phosphate coating chemicals and the functions of the individual components of the bath. The erratic corrosion behavior of the phosphate coatings is explained. A theory concerning the proper approach to improving the quality of phosphate coatings is presented as a conclusion drawn from the data presented.

ORGANIC FINISHES ON PLATED PRODUCTS

by
Gene L. Leithauser, Research Staff
General Motors Corporation

This report covers factors affecting the adhesion of organic finishes to plated parts. This will include plating procedures as well as post-plating procedures that influence the durability of the organic finish. Pre-paint methods, chemical treatments on chromium plate, and use of primers is covered. Durability of pigmented and clear finishes over plated parts are also discussed. Evaluation methods and results of surveys of durability are included.

SOME NOTES ON THE ELECTRODEPOSITION OF ANTIMONY

by
A. H. Du Rose
Harshaw Chemical Co.

The results reported are a summary of an experimental survey made to determine the properties of electrodeposited antimony as a decorative and protective coating. The outstanding property of antimony is its lack of ductility or cohesive strength. In spite of this, good but not consistently reproducible corrosion protection was obtained. There appears to be some relation between adhesion and the respective orientations of the substrate and deposit.

A TOOL FOR DECISION—ACCEPTANCE SAMPLING BY VARIABLES AND HOW IT WORKS
by
Roger H. Moore
Los Alamos Scientific Laboratory

This paper describes acceptance sampling by variables which is a set of rules for deciding whether or not a lot of production pieces is acceptable under specification limits. The effectiveness of the set of rules is measured by the shape of an operating characteristic curve which gives the probability of accepting a lot if it has a certain proportion of defective parts in it.

FIFTH EDUCATIONAL SESSION — THURSDAY, JUNE 21

(SESSION A)

Chairman: Arthur Logozzo, Nutmeg Chrome Corp.

CHROMIUM PLATING OF GUN BORES
by
Dr. V. A. Lamb and J. P. Young
National Bureau of Standards

This paper describes the history of gun barrel plating prior to World War II, and since that period. The physical and chemical properties required of a gun bore coating are outlined, and the degree to which chromium and other metals meet these requirements is indicated. Methods for applying chromium electrodeposits to gun bores are described. Electropolishing of gun bores is also described.

THE ADHESION OF ELECTROPLATED COATINGS TO TITANIUM
by
C. Stanley and Dr. Abner Brenner
National Bureau of Standards

Good adhesion of electrodeposited coatings to titanium is prevented by an oxide film. A pretreatment for circumventing this difficulty was developed which involved the formation of a titanium fluoride coating by an electrolytic treatment in a solution of hydrofluoric and acetic acids.

HARD CHROME PLATING OF TITANIUM ALLOYS
by
L. Missel, Lockheed Aircraft Corporation

Highly adherent chromium has been applied to several titanium alloys by electroplating. The process consists of an immersion treatment in a simple aqueous bath followed by plating in a conventional sulfate bath. A simple semi-quantitative plate adhesion-bearing property evaluation test has been developed.

ELECTROPLATING CHROMIUM ON UNUSUAL ALLOYS
by
Charles Levy
Watertown Arsenal

By variations in pretreatments, chromium has been electrodeposited from a conventional bath on some unusual alloys. Included among the basis metals were high-cobalt alloys, such as Stellite 21, S-816 and V-36; high nickel alloys, such as Hastalloy B, Hastalloy C and Inconel X; molybdenum; and stainless steels, such as 502 and 19-9DL. Chromium plated AISI 4340 steel was used for comparison purposes. A nickel chloride-hydrochloric acid electrolytic treatment applied prior to chromium plating was the principal means by which sound deposits with good adhesion were achieved.

(SESSION B)

Chairman: Dr. William Blum

A NEW ORGANO-ALUMINUM CHLORIDE BATH FOR DEPOSITION OF ALUMINUM
by
Dr. Nelson F. Murphy and
Dr. Arthur C. Doumas
Virginia Polytechnic Institute

A new electrolyte for the deposition of aluminum, consisting of a solution of aluminum chloride in ether and substituted amine, is described. The limitations of operating conditions are given. The deposits are adherent, can be made of considerable thickness and may be polished. Bright deposits have been obtained from the bath at high current densities.

THE GROWTH AND PROPERTIES OF METAL WHISKERS
by
S. M. Arnold
Bell Telephone Laboratories, Inc.

An account of studies at Bell Telephone Laboratories following the discovery that failure of certain electrical equipment was a result of the presence on a metal surface of a number of microscopic filaments. The filaments or "whiskers" were found to be metal single crystals possessing unique properties. These unusual properties are attributed to a perfection of structure not found in bulk material, and hence are of interest in fundamental studies of the metallic state.

STUDY OF ADHESION BY THE HIGH SPEED ROTOR TECHNIQUE

by
Dr. J. W. Beams, Department of Physics
University of Virginia

If films of a material are uniformly deposited on the peripheries of cylindrical rotors having different radii and the rotor speeds are increased until the material is thrown off, both the tensile strength and the adhesion to the rotor surface of the material may be determined. If the material is deposited on a rotor in circumferentially disconnected patches, the absolute value of the adhesion can be obtained directly. The techniques of spinning magnetically suspended rotors in a vacuum is described and its application to the measurement of the adhesion of electrodeposited and evaporated metals on rotor surfaces is discussed.

DISSOLVED GASES IN PLATING BATHS

by
W. M. Tucker and F. O. Beuckman
Eastman Kodak Co.

It was found that a Watts nickel bath in good operating condition, when properly degassed, would yield pit-free deposits until it became saturated with a gas or gases at the temperature of operation. A suitable device ready made was found in the VanSlyke Blood-Gas apparatus. Using the VanSlyke Blood-Gas apparatus equilibrium studies indicate the limits of this approach and confirm the conditions which will produce pit-free deposits.

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TENTATIVE PROGRAM OF CONVENTION EVENTS

(Eastern Daylight Savings Time used throughout Program)

Convention Registration in upper lobby on mezzanine floor.

Sunday, June 17	1:00 p.m. to 9:00 p.m.
Monday, June 18	9:00 a.m. to 5:00 p.m.
Monday, June 18	8:30 p.m. to 10:30 p.m.
Tuesday, June 19	9:00 a.m. to Noon
Wednesday, June 20	9:00 a.m. to 1:30 p.m.
Thursday, June 21	9:00 a.m. to Noon

The registration fee of $20.00 for men and women and $10.00 for children 16 and under provides each registrant with a book of tickets covering all events on each program.

Table reservations for the Banquet on Thursday, June 21, should be made in advance at the Banquet Reservation Desk in the upper lobby, starting Tuesday, June 19, at 9:00 a.m. Banquet tickets for children are not included in their registration ticket books. These may be purchased for $7.00 additional, with their registration.

Events at the Hotel Statler unless otherwise indicated.

Sunday, June 17, 1956

9:00 a.m. National Association of Metal Finishers Board of Directors Meeting (Mayflower Hotel)

10:00 a.m. AES Executive Board Meeting (Massachusetts Room)

8:00 p.m. AES Get Together Party (Federal and South American Rooms)
Light refreshments
Admission by ticket

Monday, June 18, 1956

10:00 a.m. Opening Session and Business Meeting AES Supreme Society (Presidential Room)
Invocation: The Rev. F. C. Mesle, Rochester Branch
General Chairmen:
Arthur G. Pierdon
Kenneth Huston
Keynote Speaker:
Dr. Allen V. Astin, Director, National Bureau of Standards
Business Session:
Clyde Kelly, AES President

12:00 Noon Metal Finishing Suppliers' Association, Luncheon and Meeting (South American Room)

12:00 Noon Ladies' Luncheon (Willard Hotel) Admission by ticket

12:00 Noon Branch Secretaries' Luncheon (California Room)

12:15 p.m. Speakers' Luncheon (California Room)

2:00 p.m. Ladies' Tour of Washington (F Street entrance, Willard Hotel)
Admission by ticket

2:00 p.m.

FIRST EDUCATIONAL SESSION

Session A (Presidential Room)

"Novel Applications of Plating"

Chairman: E. R. Bowerman, Jr., Sylvania Electric Products, Inc.

1. Some Recent Developments in Selective Localized Plating for Engineering Purposes	Marv Rubinstein, Metal Finishing Consultant
2. Investigation and Evaluation of Plating Processes and Plating Combinations for Use on Etched Circuitry	E. H. Babcock, R. K. Stephens, and R. C. Grimsinger, Convair, Div. of General Dynamics Corp.
3. Overlay Plating of Steel-Back Aluminum-Lined Sleeve Bearings	A. H. Beebe, Jr., B. F. Rothschild and G. J. LeBrasse, Federal-Mogul-Bower Bearings, Inc.

	4. The Protection of Molybdenum Against High Temperature Oxidation	Julius J. Harwood, Office of Naval Research, Dept. of the Navy

Session B (Congressional Room)

"Thickness and Distribution of Coatings"

Chairman: Dr. R. B. Saltonstall, The Udylite Corporation

	1. Gaging Thin Nickel Coatings by X-Ray Fluorescence	W. W. Sellers and Kenneth Carroll, Research Laboratory, International Nickel Co., Inc.
	2. Coating Thickness Measurement by Filtered X-Ray Fluorescence	Dr. E. J. Serfass and Dr. F. A. Achey, Lehigh University
	3. Current Distribution of Microprofiles	Dr. D. G. Foulke, and Dr. Otto Kardos, Hanson-Van Winkle-Munning Co.
	4. Leveling—Definition, Measurement and Understanding	J. D. Thomas, General Motors Corp.

Admission by badge

2:30 p.m. Editorial Board Meeting (Massachusetts Room)

6:30 p.m. National Association of Metal Finishers Cocktail Party (Mayflower Hotel)

6:30 p.m. Past Presidents' Dinner (California Room)

7:00 p.m. National Association of Metal Finishers Banquet (Mayflower Hotel)

9:00 p.m. Open House (Presidential and Congressional Rooms)

All registrants will be guests of the Metal Finishing Suppliers' Association. Refreshments and dancing. Buffet served at 10:30 p.m.

Admission by ticket

Tuesday, June 19, 1956

8:00 a.m. Research Committee Breakfast (Massachusetts Room)

Speakers' Breakfast (Ohio Room)

9:00 a.m.

SECOND EDUCATIONAL SESSION

Session A (Presidential Room)

"Physical and Mechanical Properties of Deposits"

Chairman: J. Teres, Wright Air Development Center

	1. Properties of Electrodeposits at Elevated Temperatures	W. H. Safranek and G. R. Schaer, Battelle Memorial Institute
	2. Limitations of Plated Nickel in Jet Engine Design	R. W. Moeller and W. A. Snell, Pratt and Whitney Aircraft
	3. Some Characteristics of Electroformed Iron Deposits	Dr. A. M. Max, Radio Corp. of America, Dr. G. R. Van Houten, P. R. Mallory and Co.
	4. A Study of the Effect of Several Organic Addition Agents on the Hardness and Residual Stress in Nickel Deposits	I. L. Newell, The Henry Souther Engineering Co.

Session B (Congressional Room)

"Analysis and Control"

Chairman: Dr. Earl J. Serfass, Lehigh University

	1. Spectrochemical Determination of Nickel in Bright Cadmium Plating Solutions	Henry Friedberg, Morton Levy, The Frank L. Crobaugh Laboratories
	2. Complete Polarographic Analysis of Cyanide Zinc Plating Baths	Thomas H. Collard, Jr. and David K. H. Liu, Friedrich Refrigerators, Inc.

	3. The Polarographic Determination of Cadmium and Cyanide in Alkaline Cadmium Plating Solutions	G. T. Forsyth, Udylite Research Corp.
	4. Construction and Operating characteristics of a new Electroplating Cell for Current Density Studies	R. F. Walton, Radio Corp. of America and R. Gilmont, Manostat Corp.
	5. Rapid Analysis of Cyanide Plating Baths	Dr. R. F. Muraca, Jet Propulsion Labs., California Institute of Technology

Admission by badge

12 Noon Branch Librarians' Luncheon (California Room)

12 Noon "Aunt Ella" Luncheon for Ladies sponsored by Oakite Products, Inc. David X. Clarin, Host (Terrace Room National Airport) Admission by ticket

1:00 p.m. Annual Golf Tournament, Metal Finishing Suppliers' Association, Manor Country Club, Norbeck, Md.

2:00 p.m. East-West Baseball game (to be announced)

2:00 p.m. Research Committee Meeting (Massachusetts Room)

6:30 p.m. Speakers' Dinner (New York Room)

8:00 p.m.

THIRD EDUCATIONAL SESSION

Session A (Presidential Room)

"Equipment and Engineering"

Chairman: L. F. Scott, United Chromium Corp.

1. Coated Abrasive Belts Speed Metal Working Production (Motion picture in color)	E. E. Oathoat, Behr-Manning Coated Abrasives Div. of The Norton Company
2. Filter Media	M. L. Whitehurst, Elmer G. Lundberg, Quentin O. Shockley, and John M. Hood, Indianapolis Branch of American Electroplaters' Society
3. Tank Linings	Kenneth G. LeFevre, Metalweld, Inc.
4. Plating Room Tank Ventilation Equipment	F. W. Arndt, Heil Process Equipment Corp.

Session B (Congressional Room)

"Protective Value and Related Properties of Coatings"

Chairman: C. H. Sample, International Nickel Co.

1. Radiographic Detection of Pores in Plated Coatings (AES Project 13)	Fielding Ogburn and Margaret Hilkert, National Bureau of Standards
2. The Permeation of Gases Through Electrolytic Nickel Deposits as Affected by Accelerated Corrosion	Dr. J. Martin Tobin, General Electric Corp. and Dr. D. G. Foulke, Hanson-Van Winkle-Munning Co.
3. The Effect of Impurities and Purification of Electroplating Solutions. I. Nickel Solutions (9) The Effect and Removal of Aluminum	Dr. D. T. Ewing, Dr. A. J. Smith, Michigan State University, and Dr. W. O. Dow, Jr., Sunbeam Corp.
(10) The Effect and Removal of Manganese (AES Project 5)	Dr. A. J. Smith, Michigan State University and Dr. R. J. Rowe, Dow Chemical Co.

4. Progress Report on Accelerated Corrosion Tests for the Performance of Plated Coatings (AES Project 15) — Dr. W. L. Pinner, Houdaille Industries, Inc.

Admission by badge

WEDNESDAY, JUNE 20, 1956

8:00 a.m. Speakers' Breakfast (Ohio Room)

9:00 a.m. FOURTH EDUCATIONAL SESSION

Session A (Presidential Room)

"Alloy Plating"

Chairman: Dr. W. A. Wesley, International Nickel Co.

1. Electrodeposition of Porous Nickel-Cadmium Alloy — L. D. McGraw, J. P. Spenard and Dr. C. L. Faust, Battelle Memorial Institute
2. Gold-Silver Alloy Plating — A. G. Cafferty and R. E. Harr, Western Electric Co.
3. Nickel-Iron Alloy Electrodeposits for Magnetic Shielding — V. P. McConnell, Dr. I. W. Wolf, Electronics Div., General Electric Corp.
4. Improved Techniques for Electroless Nickel Plating on Non-Conductors — Dr. Harold Narcus, Electrochemical Industries, Inc.

Session B (Congressional Room)

"Three Different Coating Types—A Trilogy"

Chairman: G. A. Lux, Oakite Products, Inc.

1. Study of Phosphate Treatments for Metals — Lloyd Gilbert, Rock Island Arsenal
2. Organic Finishes on Plated Products — Gene L. Leithauser, Research Staff, General Motors Corp.
3. Some Notes on the Electrodeposition of Antimony — A. H. Du Rose, The Harshaw Chemical Company
4. A Tool for Decision—Acceptance Sampling by Variables and How It Works — Roger H. Moore, Los Alamos Scientific Laboratory

Admission by badge

10:00 a.m. AES Public Relations Task Committee (Massachusetts Room)

12:00 Noon Michigan State Alumni Luncheon (California Room)

1:00 p.m. Trip to Mt. Vernon

Buses leave from 16th Street entrance to Hotel Statler

Admission by ticket

9:30 p.m. American Electroplaters' Society Floor Show and Dance (Presidential and Congressional Rooms)

Admission by ticket

THURSDAY, JUNE 21, 1956

8:00 a.m. Speakers' Breakfast (Ohio Room)

9:00 a.m. FIFTH EDUCATIONAL SESSION

Session A (Presidential Room)

"Chromium Plating"

Chairman: Arthur Logozzo, Nutmeg Chrome Corp.

1. Chromium Plating of Gun Bores — Dr. V. A. Lamb and J. P. Young, National Bureau of Standards
2. Hard Chrome Plating of Titanium Alloys — L. Missel, Lockheed Aircraft Corp.
3. The Adhesion of Electroplated Coatings to Titanium — Connie Stanley and Dr. Abner Brenner, National Bureau of Standards.
4. Electroplating Chromium on Unusual Alloys — Charles Levy, Watertown Arsenal

Session B (Congressional Room)

"Basic Studies of Baths and Deposits"

Chairman: Dr. William Blum

1.	A New Organo-Aluminum Chloride Bath for Deposition of Aluminum	Dr. Nelson F. Murphy and Dr. Arthur C. Doumas, Virginia Polytechnic Institute, Blacksburg, Va.
2.	The Growth and Properties of Metal Whiskers	S. M. Arnold, Bell Telephone Labs., Inc.
3.	Study of Adhesion by the High Speed Rotor Techniques	Dr. J. W. Beams, Dept. of Physics, Rouss Physical Laboratory, Univ. of Virginia
4.	Dissolved Gases in Plating Baths	W. M. Tucker and F. O. Beuckman, Eastman Kodak Co.

Admission by badge

12 Noon Ladies' Luncheon, sponsored by Udylite Corp. with talk by Dr. Richard B. Saltonstall. (Mayflower Hotel)

2:00 p.m. Ladies Plato Party with Mrs. J. Wiarda in charge of prize distribution (Mayflower Hotel)

2:00 p.m. Final Business Session, AES Supreme Society (Federal Room)

7:00 p.m. Annual Banquet (Presidential and Congressional Rooms)

Admission by reservation ticket only. Your registration book ticket must be exchanged for a special Banquet ticket. Ticket exchange starts at 9:00 a.m. Tuesday, June 19, at Banquet Reservation Desk in upper lobby.

LADIES' PROGRAM

SUNDAY, JUNE 17, 1956

8:00 p.m. Get Together Party

This is the time and place to greet your your old friends and to make new ones. Come one, come all!

Refreshments

Hotel Statler, Federal & South American Rooms

Admission by ticket.

MONDAY, JUNE 18, 1956

10:00 a.m. Opening Session

Ladies, see your men off to a good start for a successful Convention! Hear Dr. Allen V. Astin of the National Bureau of Standards deliver the keynote address.

Hotel Statler, Presidential Ballroom.

12 Noon Luncheon

Meet with the Ladies Committee for luncheon in the newly decorated Grand Ballroom of Washington's most historic hotel—The Willard—Here presidents have resided; the great have registered; historical decisions have been made; and all are graciously received.

Willard Hotel, Grand Ballroom

Admission by ticket.

2:00 p.m. Washington Tour

Get a bird's eye view of your Nation's Capital.

F Street Entrance—Willard Hotel

Bus Ticket in Ladies Book

9:00 p.m. Metal Finishing Suppliers' Association Open House

Fellowship, refreshments, and dancing will make a long to be remembered evening.

Buffet Supper at 10:30

Door Prizes

Hotel Statler, Presidential and Congressional Rooms

Admission by ticket.

TUESDAY, JUNE 19, 1956

12 Noon Luncheon

The Aunt Ella Society Luncheon, sponsored by Oakite Products, Inc. awaits you at the Terrace Dining Room, National Airport. Dave Clarin, our genial host, makes it a delightful party in a most unusual setting.

Admission by ticket.

WEDNESDAY, JUNE 20, 1956

1:00 p.m. Trip to Mt. Vernon

Buses: 16th St. Entrance—Hotel Statler

This is your opportunity to see the Changing of the Guard at the Tomb of the Unknown Soldier, to ride through Old Alexandria, to visit Mt. Vernon, and to enjoy a beautiful boat ride on

historic Potomac River. Use tickets as marked.

9:30 p.m. **Floor Show and Dance**
Hotel Statler, Presidential and Congressional Rooms
A gala evening of fun and dancing is in store for you. Don't miss.
Admission by ticket.

THURSDAY, JUNE 21, 1956

12 Noon **Luncheon**
The Udylite Corporation entertains you in the Grand Ballroom of the elegant Mayflower Hotel. Our host, Dr. Richard Saltonstall, will conduct the ladies' "Educational Session." He will discuss "What the Quality of Plating Means to You."
Admission by ticket.

2:00 p.m. **Plato Party**
Is this your lucky day? Mrs. Joan Wiarda, our Guest Hostess "with the mostess," provides an afternoon of fun.
Mayflower Hotel—Grand Ballroom
There will be fabulous prizes galore.
Admission by ticket.

Before leaving you will receive:

1. Orchids from the Rapid Electric Company
2. Ladies gift from the Baltimore-Washington Branch.

Use tickets in book

7:00 p.m. **Annual Banquet—Dancing**
Hotel Statler—Presidential and Congressional Rooms
A grand climax for your Washington visit! Be sure to change your Banquet ticket for a table reservation.
Prizes and awards will be made this evening.

The Washington Tour at 2:00 p.m. on Monday will give the Ladies an all over look at the beauties of Washington. Optional tours have been arranged which will allow more time for seeing individual features of the city.

1. "Tuesday, June 19, 8:30 a. m. An optional sightseeing trip. Tour B, Interior of Public Buildings. Price $2.00 Tickets may be purchased at Registration Desk."
2. "Wednesday, June 20, 8:30 a.m. An optional sightseeing trip. Tour E, Shrines and Cathedrals. Price $2.00. Tickets may be purchased at Registration Desk."

Tickets for these trips will be available on the preceding day to enable us to order the buses.

CHILDREN'S PROGRAM

SUNDAY, JUNE 17, 1956

8:00 p.m. **Get Together Party**
Hotel Statler, Federal & South American Rooms—Admission by ticket.

MONDAY, JUNE 18, 1956

11:00 a.m. to 4:00 p.m. **Sightseeing**
Bus: Hotel Statler—16th St. Entrance
National Zoological Park
Lunch
Smithsonian Institute & Museum of Natural History—Use ticket in book.

9:00 p.m. **Metal Finishing Suppliers' Association Open House**
Admission by ticket.

TUESDAY, JUNE 19, 1956

10:00 a.m. to 4:00 p.m. **Sightseeing**
Bus: Hotel Statler—16th St. Entrance
Washington Monument
U. S. Capitol (Guided Tour)
Lunch
Federal Bureau of Investigation
Trip through Potomac Park
Use ticket in book.

WEDNESDAY, JUNE 20, 1956

1:00 p.m. **Trip to Mt. Vernon**
Bus: Hotel Statler—16th St. Entrance
See Changing of the Guard at the Tomb of the Unknown Soldier
Ride Through Old Alexandria
Visit Mt. Vernon
Enjoy a boat ride on historic Potomac River—Use tickets as marked.

9:30 p.m. **Floor Show**
Admission by ticket.

THURSDAY, JUNE 21, 1956

10:00 a.m. to 4:00 p.m. **Sightseeing**
Bus: Hotel Statler—16th St. Entrance
White House
Bureau of Printing & Engraving
Lincoln Memorial
Lunch
Washington National Airport
Use ticket in book.

AES NEWS

Astin

NBS Director, Astin, Convention Keynote Speaker

Dr. Allen V. Astin, Director of the National Bureau of Standards, Washington, D. C., will address members of the AES on June 18, 1956. Astin, recipient of many awards, especially for his contributions to National Defense, will talk before the Supreme Society at the Washington Statler opening the 43rd Annual AES Convention. Dr. Astin's topic will be announced in the June issue of PLATING.

Born in Salt Lake City, Utah, Astin received his BS from the University of Utah, his MS and PhD from New York University. He joined the National Bureau of Standards in 1930 as a research associate after he matriculated at John Hopkins University as a research fellow on dielectric measurements. In 1932 he became a member of the Bureau of Standards staff. From 1932 to 1940 he was engaged in researches on ignition, electronic and electrical problems. From 1940 to 1948 he conducted studies on proximity fuses and in 1948 became chief of that division. Astin was made associate director in 1950 and in 1952 he was appointed Bureau director by the President of the United States.

He has published numerous scientific papers on dielectric constants cosmic rays and related subjects.

400 Sustaining Member Goal Set by Research Committee

A goal of 400 Sustaining Members by the date of the Washington convention was approved by the AES Research Committee at its meeting in Dayton, Ohio on March 9. Proposed by Arthur Wrisberg, chairman of the finance and publicity subcommittee, this means an addition of 58 new members for the attainment of this mark. At the present time, there are 342 Sustaining Members who hold 381 multiple memberships, a considerable increase over the previous year.

The Research Committee acted on the following items of business: heard a report from project 10 at Yale University announcing the termination of that project by November 1, 1956; discussed the problem of an inability to obtain the services of an associate at Project 17 at the Virginia Institute for Scientific Research; heard a report from the Publications Committee which in part stated that the lack of volunteers and time, force the postponement of the publication of the Plating Process Control Handbook to late 1956; accepted with regret the resignation of Dr. Ralph A. Schaefer as district supervisor of Projects 16 and 17 due to the pressure of business and time; received a History of Research Committee Projects since the inception of the Society research program as compiled by Dr. Edward A. Parker; discussed further possibility of a Sustaining Member seal or sticker; heard a report from Arthur Wrisberg suggesting that branches present reports of their Sustaining Membership activities at their monthly meetings; received a slate of six nominees to the 1956–57 research committee for submission to the Executive Board; and heard a report by Dr. Arthur H. DuRose, chairman of the subcommittee on research.

Those who attended included: Chairman Leslie C. Borchert, Houdaille Industries; Dr. Edward A. Parker, Tehnic, Inc.; Dr. Arthur H. DuRose, The Harshaw Chemical Co.; Arthur P. Wrisberg, The Davies Supply Co.; George E. Best, Mutual Chemical Co.; Robert Ehrhardt, Bell Telephone Labs; AES President Clyde Kelly, American Plating Co.; and Executive Secretary Peter Kovatis.

The next meeting of the committee is scheduled for June 19, 1956, Washington, D. C.

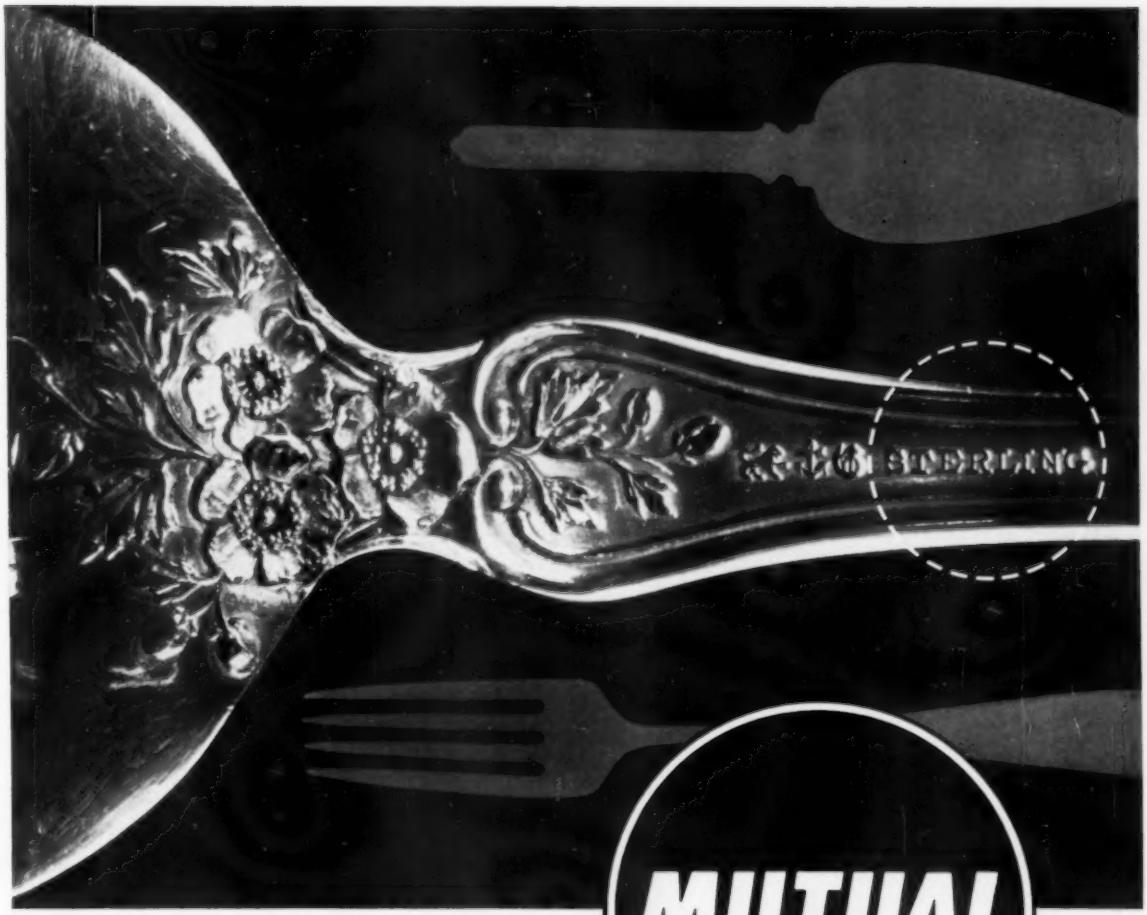
Pierdon Family teams up for convention. This fine-looking group represents a formidable nucleus of the Baltimore-Washington branch convention committee discussing individual assignments. Left to right: Henry A., registration; Elizabeth R., children's program; Margaret J., convention committee recorder; Arthur G., convention co-chairman; Mrs. Arthur G., ladies' program chairman; Mary Ellen, secretary to convention co-chairman, and Florence M., information desk. Absent when photo was taken: Fred A.

Two more progressive firms have joined the AES Research effort through the important medium of the Sustaining Membership program. The new firms are:

Firm and City	*Branch Credit*
Dayton Rust Proof Co. Dayton 4, Ohio	Dayton
Reliable Plating Corp. Chicago, Illinois	Chicago

Number of Sustaining Members supporting AES Research through this month	341*
Number of Sustaining Members supporting AES Research through last month	342

*This represents a net gain.



MUTUAL

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The word 'sterling' means the best in quality silverware the world over. In fact, this word is the trade mark demanded by discerning people wherever fine silver is examined.

Likewise, users of Chromium Chemicals know exactly what our trade mark means. The word Mutual on any container of Chromium Chemicals stands not only for guaranteed top purity of the product itself, but also for the outstanding reputation of the Company. When you are in the market for Chromium Chemicals, look for the name Mutual, a symbol for quality.

Chromic Acid • Sodium Bichromate • Potassium Bichromate

MUTUAL CHEMICAL DIVISION

MUTUAL — ALLIED CHEMICAL & DYE CORPORATION

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Allied Chemical

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In Harmony are members of the 17th Annual N.E. Regional Committee whose efforts resulted in a record turnout this year. Chairman William Murray (seated), back row: F. Tatum, H. Heissfeld, T. Voyda, C. Kuster, S. Henn; front row: S. Platoz, R. Girard, Mrs. J. Madzik and J. McInerney

N.E. Regional Speakers pose with educational program chairman Robert Girard. Left to right: Barnet Ostrow, William Phillips, Girard, AES 1st Vice President Samuel Heiman, Arthur Kohler

Three of Many Bingo Prize Winners at 17th Annual New England Regional Meeting pose with Ladies' Program chairman, Julie Madzik, and "loot." Left to right: Mrs. Eugene Chapdelaine, Mrs. James Pelosi, Mrs. Madzik, and Mrs. Adam Walsh. Distaff program was meeting highlight

700 ATTEND 17TH ANNUAL NEW ENGLAND REGIONAL

The 17th Annual New England Regional at Hartford, Conn., on April 7 attracted a record 700 members and friends. Sponsored by AES Branches representing Waterbury, Hartford, Springfield, Bridgeport and New Haven, this year's meeting featured a five-star program described as "second only to the annual National Convention."

AES Past President A. Logozzo, left; PLATING Asst. Advertising Manager R. Buehler, center, and N.E. Regional treasurer, B. Gaffney, extol merits of PLATING magazine between talks

Under the General Chairmanship of William K. Murray, Enthone, Inc., of the host New Haven branch, the program included an educational session, ladies' program, cocktails, dinner, and dancing at the new Hotel Statler. Robert J. Girard of the Springfield branch was Chairman of the Educational Program which offered the following speakers and talks: Arthur S. Kohler, Frederick Gumm Chemical Company, "Barrel Burnishing"; William Phillips, Deering-Milliken Company, "Textiles for Buffing"; and Barnet D. Ostrow, Lee Ronal, Inc., "High Speed Bright Plating of Brass, Copper, and Nickel in Barrels."

The Hartford Chapter of the SPEBOSA (barber shop singing organization) gave forth with a fine selection of songs which featured 60 male voices. William Jenny's orchestra provided dancing from 9 to 1 a.m.

The Regional Meeting Committee which worked so hard to make the 17th Annual meeting the biggest yet: William K. Murray, New Haven, General Chairman; Charles A. Kuster, New Haven, Secretary; Bernard J. Gaffney, New Haven, Treasurer; Robert J. Girard, Springfield, Educational Chairman; Richard C. Barrett, Bridgeport, Publicity; Joseph P. McInerney, Hartford, Entertainment; Mrs. Julie B. Madzik, Hartford, Ladies; and Richard P. Crane, Waterbury, Program Advertising.

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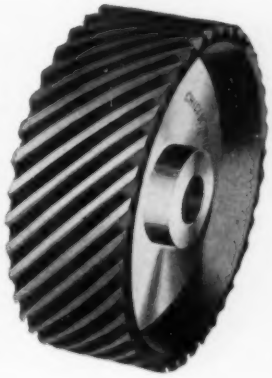

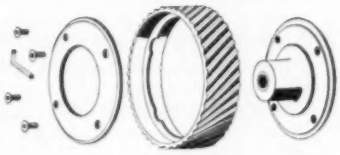

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You replace only the tire when necessary and not the entire wheel. Choose from a complete assortment of treads in a wide variety of Durometers to best suit your grinding or polishing requirements. Our engineers will gladly make specific recommendations.

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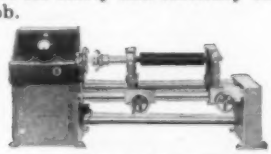

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Tri-State Regional Principals pose for photo. Left to right: Dr. Charles L. Faust, Cleve F. Nixon, AES National President Clyde Kelly and Helmer Bengston

Plating Staff Photos

Working Committee of Tri-State Regional go over last minute details in Dayton. Left to right: (seated), John Easton, Holle Luechauer, Robert Ruleff, Norbert Mollmann, and Jack Baker; (standing), Frank Klein, Al Wendt, Fred Bauch, Dick Clinehens, R. Collins, and Julius Teres. (Absent when photo was taken: Ezra Blount and Bennie Cohen)

Third Tri-State Regional Attracts Record Crowd in Dayton

The largest turnout thus far was recorded at the Third Tri-State Regional Meeting in Dayton, Ohio, March 10 at the Hotel Biltmore. Close to 900 attended the banquet and approximately 200 crowded the Biltmore Room for the afternoon educational session.

Sponsored jointly by the AES branches of Cincinnati, Columbus, Dayton, Indianapolis, and Louisville, this year's regional meeting was under the general chairmanship of Robert L. Ruleff and Holle Luechauer, co-chairman, both of Dayton.

Clyde Kelly, AES National President, served as moderator of the educational session. After the showing of colored slides of National Headquarters, Kelly introduced the formal program which featured talks by the following: Helmer Bengston, Stolle Corporation, who spoke on "Color Anodizing"; Dr. Charles L. Faust, Battelle Memorial Institute, who presented "Plating on Unusual Metals"; and Cleve F. Nixon, Head of the Dept. of Electrochemistry Research Staff, General Motors Corporation, who discussed "Plating for Out-of-Door Exposure."

Out-of-town dignitaries included Ralph Wysong, candidate for the AES National Third Vice-Presidency; AES Past President and Mrs. William J. Neill, members of the AES Research Committee who convened in Dayton on Friday, and Executive Secretary, Peter Kovatis.

Next year's Tri-State Regional will be held in Indianapolis on April 27 with the Indianapolis branch acting as host.

The following assisted general chairman Ruleff and co-chairman Luechauer; Frank Klein, hotel reservations; Bennie Cohen, entertainment; Al Wendt, favors; Fred Bauch, plant visitations; John Easton, program advertising; Norbert Mollmann, secretary; Jack Baker and Julius Teres, tickets; and Ezra Blount and Dick Clinehens, publicity.

The AES Public Relations Task Committee pose with members of the Columbus branch at a recent meeting of that branch. The task group had met in Columbus on the day of branch meeting to set up machinery for formation of permanent Society Public Relations Committee and were guests of the branch at the evening session at Battelle Memorial Institute. Left to right: PR task committeeman, Executive Secretary Peter Kovatis, Columbus Branch President Dr. Nathan L. Koslin, branch speaker Louis G. Nowacki of Battelle Memorial Institute, PR task committeeman Lew Glassner, AES Past President and PR task committeeman Cleve Nixon and PLATING advertising manager and PR task committeeman H. George Burnley. (Absent when photo was taken: A. Doria, F. Tirendi, L. W. Porter and R. H. Heppel, all members of the PR task committee.) (Photo by Columbus Branch Librarian George Skelly)

Baltimore-Washington Branch presents 11th "pot" award to National President Clyde Kelly at a meeting of the branch on March 12 at the Baltimore Park Plaza Hotel. The presentation was made by AES Past President Ken Huston on behalf of the Order of Past Presidents, sponsors of the award. Silver plated and gold lined, the "pot" was manufactured by the Art Metal Finishing Company of Washington, D. C. In receiving the award, Kelly became eligible for membership in the Order of Past Presidents of the American Electroplaters' Society. Left to right: Dr. W. Blum, Kelly, Huston, Branch President William Metzger

Plating Staff Photo

Meet Some More Presidents

Herman A. Tessman was born in Wisconsin in 1922 and spent his youth there doing routine chores and studying hard so he could enter the University of Wisconsin to study chemistry. The war interrupted his schooling and he served in the Army for three years. Mechanical engineering was studied at the University of Kentucky and he received his BS in Chemical Engineering from the University of Wisconsin in 1947.

Tessman
Milwaukee Branch

Herman started at the Allen-Bradley Co. in 1947 and in 1949 he was appointed foreman in charge of all metal finishing at the plant. He is a member of the Milwaukee Branch of the AES and has served as 2nd vice president in addition to his present term as Branch President. Herman is also a member of the Milwaukee Junior Chamber of Commerce, and has been associated with the ASM and the Milwaukee Safety Commission.

Wm. H. Trusdell was born in Philadelphia in 1904 and was graduated from Spring Garden Institute. Bill has been associated with the plating industry for twenty years and is employed by Platers and Coaters, an affiliate of Advance Specialty Company, as plating superintendent. Trusdell has held all offices in the Philadelphia Branch and is now serving his second term as Branch President. In 1953, he was a member of the Philadelphia Convention Committee. In addition to his duties as Branch President, Bill is an ardent salt water fisherman, an Institutional Representative of the Boy Scouts and Cubs, member of the Advancement Committee and Board of Review, President of the Lansdowne Methodist Men's Association and is active in all local civic affairs. Bill is married, has three children and three grandchildren.

Trusdell
Philadelphia Branch

The Nalin Laboratories of Columbus, Ohio, was founded a little over ten years ago when Dr. Nathan L. Koslin realized his desire to have an independent consulting and analytical laboratory. One of his fields of specialization is metal finishing, and he has been servicing the plating industry since the inception of the Laboratories. Prior to this time, he worked for Wyandotte Chemicals Corporation as a research chemist, taught organic chemistry at Wayne University, and worked in the University of Akron Testing Laboratory.

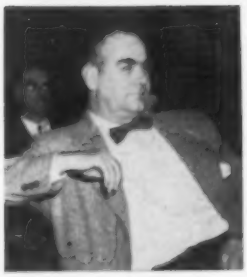
Koslin
Columbus Branch

Dr. Koslin has been an active member of the Columbus Branch of the AES since coming to Columbus. In addition to being president, he has held the positions of Secretary-Treasurer and Vice President. He was born in Akron, Ohio, graduated from the University of Akron, and received his MSc and PhD degrees from the Ohio State University. He is married and has two sons.

In addition to the AES, he is a member of the American Chemical Society, American Association for the Advancement of Science, American Society for Testing Materials, Phi Lambda Upsilon, and Sigma Xi Societies.

REMEMBER ... JUNE 17 TO 21 IN WASHINGTON D. C.

BRANCH NEWS



The PLATING camera caught assorted views at the New York Annual Educational session on February 11. Here can be seen Dr. E. Saubestre (who was chairman) with Dr. D. G. Foulke, Dr. H. B. Linford, Jonathan Rintels. (Harry Hirschman joined Rintels later to answer questions, but the photographer missed him.) Among the distinguished gentlemen in the audience were Dr. S. Heiman, AES 1st Vice-President, (who also spoke at the end of the program); Dr. George Swift, AES Past President; George Wagner of Newark; W. Trusdell, President, Philadelphia Branch; and Frank Eddy, AES 2nd Vice-President. (Plating Staff Photos)

BALTIMORE-WASHINGTON

President Kelly Joins OPP; Bowerman Talks on Circuitry

The March meeting of the Baltimore-Washington branch was held in the Coach Room of the Park Plaza Hotel in Baltimore on Monday, March 12, 1956. Our guest list included National President **Clyde Kelly** and Executive Secretary **P. Peter Kovatis.**

Festivities began with cocktails, followed by a broiled chicken dinner. Dinner finished, president **Metzger** called the meeting to order at 9:20 P.M.

Our first order of business was to stand for a minute in silent tribute to our dear friend and member **Tom Slattery,** who died on February 25, 1956.

Fielding Ogburn and **Ray Stricklen** were appointed as a committee to nominate a slate of branch officers to be presented at the May meeting when the election of officers will take place.

The meeting was then turned over to **Ken Huston** who proceeded to induct our guest of honor, National President Clyde Kelly, into the Order of Past Presidents (formerly the order of the Pot).

Following his induction, president Kelly showed us color slides of the national offices and personnel, and explained how the business of the national offices was conducted.

The speaker of the evening, **Dr. E. R. Bowerman** of Sylvania Electric Product Company was introduced by president Metzger.

Dr. Bowerman, who is chairman of the Committee of AES Research Project No. 16, gave us a brief outline on the status of that project before speaking on printed wiring.

On printed wiring, he discussed a number of methods used to obtain circuits of this type, all of which are attached to or formed upon panels of nonconducting materials. He told how hollow and round edged dies were used to press solid conducting material

E. R. Bowerman, Jr., center, explains principle of aluminum circuitry to **E. Bertucio,** B-W branch librarian, (left) as **C. Thiede,** branch secretary listens in during break at meeting of March 12. (Plating staff photo)

and silver powder onto surfaces of these panels, how a conductive lacquer could be applied through a silk screen process, and how the circuits could be formed by electroplating. He stressed the fact that extreme quality control was necessary for the successful use of the methods discussed.

Dr. Bowerman explained where and how the electroplater fits into this scheme and aroused quite a bit of interest when he told how electroformed dies with cutting edges were being used with good results in producing some of the circuits.

His talk was illustrated with slides and very well presented.

BRIDGEPORT

Long Meeting, No Fights

The regularly scheduled business meeting and educational session of the Bridgeport branch AES was held in the main ballroom of the Hotel Barnum on Friday, March 9. Forty-six members and guests were present.

Floyd Tatum, 2nd vice-president presided and called the meeting to order at 8:27 P.M.

Carl Annecharico was accepted as active member as were **Martin J. Sondej** and **Henry J. Honcz.**

New England Regional committee vice-chairman **William Lindsay** reported that all plans had been finalized and that the only thing necessary to do now was to completely sell out the allotted tickets in order to make the affair a complete success.

Olde-timer's Nite—**Bill Ehrencrona,** chairman, reported on the recent affair held in the Viking Club Hall. A good time was had by all who attended; and although a slight financial loss was experienced, it had been oversubscribed by **R. Barrett.**

Herman Braun reported that **John Schneider** was ill.

President **Allen Ferguson** withdrew his candidacy for this office. There were no further nominations. The following comprise the slate as nominated to date. 1st vice-president, **Allen Ferguson, Floyd Tatum;** 2nd vice-president, **Michael Tamas;** Librarian, **Charles Bryan, William Lindsay, Allen Ferguson;** secretary-treasurer, **R. Parker; Al Ferguson;** sergeant-at-arms, **Henry Maskowski; William Hyatt.** There were no further nominations for board of managers nor for delegate and alternates.

A letter from the Vice-President of the Supreme Society concerning Branch Exhibits was read to the members. The branch went on record in saying that they were not interested in preparing a branch exhibit and to notify the officer in charge of their feelings.

The board of managers reported on the history of **Howard G. Rice's** tenure of membership. He had become a member of the Society in 1922 and had transferred to Bridgeport in 1926. His uninterrupted membership of 34 years merited some consideration from the branch. A motion was made and passed that he be accorded an honorary membership in the branch and to confer this honor and a suitable occasion, possibly the April meeting.

Carl Schaefer asked for the branch's opinion regarding the Supreme Society's request for permission to exceed their budget on the "book sales" program. In as much as all our delegates are uninstructed, Schaefer was advised that the decision was his.

Bob Parker reported on the progress made concerning the possible sponsorship by the branch of a class in electroplating. Further investigation was deemed necessary in view of the many problems that are involved in the proper formation of such an endeavor. **Milton Gellis** of State Testing Laboratories offered the facilities of his company towards the possible visual and mechanical aids that may be used in the proposed course of study.

Allen Ferguson, chairman of the Christmas dance for 1956 asked for an opinion from the branch as to their preference where the dance was to be held. After a discussion the Hotel Barnum was agreed upon. However Ferguson was advised that he had the authority to do whatever he pleases.

The meeting was turned over to Michael Tamas, branch librarian, who introduced the featured speaker of the evening, **Walter Kisner** of the Research and Development Division of the Ordnance Department at the Springfield Armory. His talk titled "Vapor Deposition of Metals," profusely illustrated with slides was well received. After a question and answer period the meeting was adjourned. Late adjournment prevented our seeing the scheduled Friday night fight; however, refreshments were served.

BOB PARKER
Secretary-Treasurer

BUFFALO

Ostrow on Bright High Speed Silver Plating

The Buffalo branch meeting of the AES met March 2, with president **A. A. Janis** presiding.

Two lady visitors, **Mrs. R. E. Campbell** and **Mrs. C. J. Wernlund,** were introduced to the Buffalo branch.

Boris Joffe reported favorably on the advertising for the Empire Regional Meeting.

Ben Fortin reported that all arrangements are now complete for the Empire Regional Meeting.

The ladies program will be a style show and tea.

President Janis appointed **Joe Ruff, Robert Guy** and **W. M. Fotheringham** as nominating committee to report at the April meeting.

Frank Rudolph, the librarian, introduced the speaker of the evening **Barnet D. Ostrow,** general manager of Lea Ronal Inc. who spoke on "Bright High Speed Silver Plating" which was followed by a discussion period.

ERIC G. SAMPSON, JR.
Secretary

CHICAGO

Harr is President; Glassrud Talks on Barrel Finishing

On Friday March 9, Chicago branch of AES assembled at the Western Society of Engineers for their regular monthly meeting and educational session.

Harr

After the usual friendly get-together during the cocktail hour and an excellent dinner, the group took up the important business of electing its officers for the coming year. There was a unanimous acceptance of the slate submitted by the nominating committee.

The officers chosen to direct the branch activities for the coming year were:

President, **Russell E. Harr;** 1st Vice-President, **Ralph E. Pettit;** 2nd Vice-President, **Charles R. Silhavy;** Librarian, **R. Scott Modjeska;** Secretary-Treasurer, **Paul Glab.**

Board of Managers: Chairman, **S. P. Gary, Jr., Ed Stanek, Matt Dassinger.**

Delegates: **Russel E. Harr, Paul Glab, Clyde Kelly.** Alternate Delegates: **H. A. Gilbertson, Joseph M. Andrus, Marion E. Lonfield.**

Following the election of officers, the branch heard an excellent presentation by **C. J. Glasrud,** technical supervisor of the Honite Division, Minnesota Mining and Manufacturing Company on the subject of "Precision Barrel Finishing," as applied to abrasive finishing. Pointing out that barrel finishing is a cold abrasive process for the removal of metal, Glasrud followed through to cite applications for the process. His discussion covered the cleaning of castings, deburring, alkaline or acid cleaning and coloring. In general, barrel finishing is most economical when applied to small parts, although large parts can be handled.

Discussing the media used in barrel finishing, Glasrud stated that both natural and synthetic materials have been used successfully. The choice depends upon the material being processed. Chief among the synthetic materials, is aluminum oxide. The chief natural material is granite. Proceeding to barrel finishing compounds, he pointed out that two types are in current use. These are cleaning compounds and abrasive compounds.

His comments on the factors involved in the choice of a barrel finishing operation such as barrel speed, chip size, and compound type in relation to the rate and degree of metal removal were well stated.

The members present showed their appreciation and considerable interest in the subject by the many excellent questions which they asked. Two questions of general interest were:

Q. Can deburring be accomplished without removing other metal?

A. Removal of other metal can be minimized but not entirely prevented during deburring operations.

Q. Should the water in a finishing barrel be maintained at a low or a high level during operation?

A. The water level should be maintained at a low level for cutting operations and at a higher level for polishing operations.

Glasrud's comprehensive presentation of the subject reflected his excellent technical experience and background.

Friends and members of the branch will be pleased to learn that **Fran Lanz** is making a good recovery from his recent illness. After having recuperated in Florida he is once more on the active list at Northwestern Plating Works.

Ed Stanek, who has charge of the Annual Ladies Night Dinner Meeting reports that this year will prove no exception to the tradition. An evening of just good fun is planned for Chicago members and their ladies who will wine and dine at Algauer's Fireside Restaurant, 7200 Lincoln Avenue on April 13 and enjoy their usual homey get-together.

JEROME KUDERNA
Publicity Chairman

COLUMBUS

A Change in Tri-State Rep; Bertucio on Chromium Plating

The regular monthly meeting of the Columbus branch AES was held at Battelle Memorial Institute on Friday, March 2 at 8:00 P.M.

The meeting was called to order by president **Nathan Koslin.**

Walter Denney, representative to the Tri-State Committee, reported that about 840 tickets to the Annual Tri-State Meeting have been sold to date. He advised members who had delayed getting their tickets to act promptly since his final report for the Columbus branch would be sent in on March 3.

The minutes of the February meeting were read and approved.

Head

President Koslin read the letter from AES 3rd Vice-President **Herberth E. Head,** requesting branch opinion on branch exhibits at conventions. After a discussion of this matter, the secretary was instructed to reply by letter.

President Koslin announced that **Walter Denney** will retire from the office of senior Columbus branch representative to the Tri-State Committee and that **Douglas Gordon** will assume this post. **Rudolf Skriletz** was appointed to the office of junior Columbus branch representative.

President Koslin appointed the following nominating committee: **William J. Neill,** chairman; **John Beach** and **Halvor Christiansen.** This committee is to present a slate of candidates for branch offices in the April meeting.

The desirability of exhibiting at the 1956 Ohio State Fair was discussed. A committee will be appointed to consider this subject further.

A request for a transfer to the Cleveland branch has been received from **J. Edwin Bride** who has left Battelle Memorial Institute to become associated with Diamond Alkali Company.

Librarian George Skelley introduced the speaker of the evening, **Edward Bertucio** of Mutual Chemical, who spoke on "Special Applications of Chromium Plating." After an interesting question and answer session, librarian Skelley announced that **Dr. Leslie E. Lancey** would speak on "An Integrated Waste Disposal System for Plating Plants," at the April meeting.

The meeting was then adjourned in favor of coffee and donuts by **Don Swickard.**

MICHAEL FARR, JR.
Secretary

DAYTON

No Meeting; 841 Attend; Three Speakers Speak

The Dayton branch did not have a regular meeting in March, instead they were host to the Third Tri-State Regional Meeting March 10.

Nixon

Faust

This was a very successful meeting. Approximately 200 members and friends attended the afternoon educational session which featured three speakers; **Dr. Charles Faust, Helmer Bengston** and **C. F. Nixon.**

The banquet and dance was attended by a record 841, and a very good time was had by all.

R. M. CLINEHENS
Secretary

DETROIT

An Electroplating Course is Announced

Two hundred members and guests were present at Ladies' Night, the March meeting of the Detroit branch, which was held at the Statler Hotel on March 2.

The meeting was started with a movie taken while on flight over the United States. **Lee Morse,** president, officially opened the meeting at 9 P.M. at which time he announced that **Dave Hardesty,** of General Motors Research, would start a course in Electroplating on March 10. Classes will be held each Friday evening at 8 P.M. at various organizations throughout the city.

Wright Wilson reported that a profit of $769.00 was made at the Christmas party last December.

The speaker of the evening, **Joe Gurski,** of Ford Motor Company, was introduced by **Doug Thomas.** Gurski spoke on his recent trip to Europe and showed some very interesting colored slides. Some of the cities he visited were London, Paris, Cologne and Dusseldorf.

The meeting adjourned for refreshments at 10:15 P.M.

PATRICK J. DRISCOLL

GRAND RAPIDS

John Dykstra is President; Wayne Fuller Wins Prize

Approximately 45 members were present for dinner at the March 9, meeting of the Grand Rapids branch.

President **Perry Burnham** brought the business meeting to order by asking for a vote of acceptance for the three new applicants, **Charles H. Kelley, Frank E. Winters** and **Frank R.**

Fuller

Selzer. The applicants were unanimously approved as members.

The Grand Rapids branch Paper Award of one-hundred dollars was presented to **Wayne Fuller** for his paper published in PLATING entitled "Organic Coatings for Electroplaters."

Appointment of convention delegates was deferred until a later date.

The following members were nominated to hold office for the 1956–57 fiscal year: President—**John Dykstra;** Board of Managers—**Carl Green;** 1st Vice-President—**Dick Watson;** 2nd Vice-President—**Paul Waalkes;** Secretary—**Donald Smith;** Treasurer—**Patrick Norton;** Librarian—**Edward Krook;** and Assistant Librarian—**Jack Hanney.**

A motion was carried by voice vote that these candidates be approved.

A motion was then made that a committee be appointed to investigate the relative size of the plating industry in the Grand Rapids area for publicity purposes and was enthusiastically approved by the membership.

The meeting was then turned over to librarian John Dykstra who introduced the guest speaker, **William Hodgsen,** a power conversion engineer for the Westinghouse Corporation, who spoke on the subject "Germanium Power Rectifier for Electroplating and Anodizing." A spirited question and answer period reflected the general interest shown in Hodgsen's subject.

THOMAS C. HENNER
Publicity Chairman

HAMILTON

Two Meetings; One Successful Annual Dinner Dance

On Friday, January 20, the Hamilton branch held their monthly meeting at Fischer's Hotel. President **Bill Finlay** welcomed the members and guests to the meeting and announced the branch's Annual Dinner-Dance for February 18 at Mundy's Restaurant.

This meeting was in the form of a "Film Night." The film shown was "Corrosion in Action," obtained through the courtesy of the International Nickel Company, Toronto. Everyone enjoyed this excellent presentation of such a complex subject, and an enthusiastic discussion followed. Our own **Dave Moss** ably performed as projectionist for the evening.

Thirty-four members and guests were in attendance.

On Saturday, February 18, the Hamilton branch held their annual Dinner-Dance at Mundy's Restaurant. Despite the bad weather, over fifty members and wives attended and enjoyed an evening of dancing and entertainment.

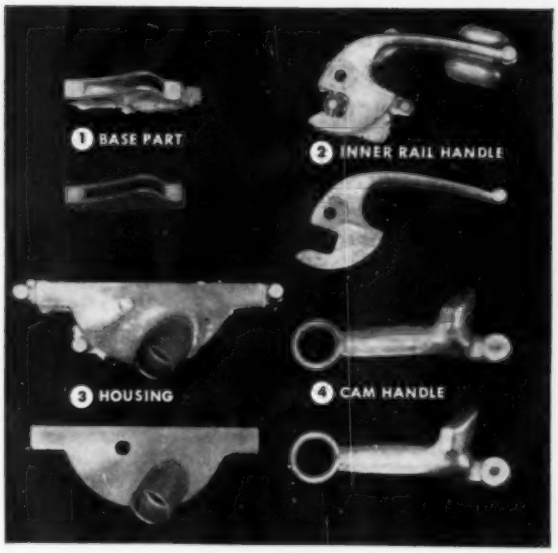
Out-of-town guests were present from Toronto, Kitchener and Port Credit. Numerous door prizes, donated by suppliers and local industries, were given away during the evening and added to everyone's enjoyment.

NORMAN A. GRAHAM
Secretary

INDIANAPOLIS

Pinner on Project 15

The March 7 meeting and dinner was held at Brodey's Village Inn at 21st and Arlington Avenue with forty-five members and guests present. Following introductions and reports of secretary and treasurer, reports were given on Tri-State meeting and our own annual affair. **Roman Bender** reported that contributions were coming in nicely; **Frederick Anderson** reported that the program is all set for the educational session and **Edna Rohrabaugh** reported that favors for the ladies were chosen and ordered.



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Pinner

Concerning the history of our Indianapolis branch, **Ed Bruck** is hunting information of the charter meeting and who the charter members were. He has found several items of interest but desires much more.

The next meeting of this branch will be given by our own members. The committee on the paper "Filter Media" will give it.

A transfer of membership was accepted in a motion by **Bert Hawhee** and seconded by **Jack Vaughan.** This transfer is for **Robert Cook,** Fortville, Indiana. Two new members were voted into the Society in a motion by Bruck and seconded by Hawhee. They were **Robert J. Perry,** Indianapolis 18, Indiana, and **Kenneth F. Blanck,** Whiteland, Indiana.

In a motion by **Lowell Fisher** and seconded by Hawhee, the secretary's expenses are to be paid to the Tri-State meeting. This motion was passed.

The branch was honored and privileged when **Walter Pinner,** a former National President of AES was present and gave us a message on Project No. 15. He gave the many tests tried out in the motor-car city of Detroit which numbered twenty in all. The project to date is valued at over one hundred thousand dollars but has cost the AES $150.00 in all. Test parts have been put on over 200 taxicabs in Detroit and on two dozen privately owned cars. He stated that hours of compliance of the salt spray test shall be agreed upon by purchaser and user. Many slides were shown and the results certainly were easily visualized by the group. After the talk, many questions were asked by the group.

EDNA ROHRABAUGH
Secretary

LOS ANGELES

L. Truman Stoner is President

The regular monthly meeting of the Los Angeles branch of the AES was held on Wednesday, March 14 at the Rodger Young Auditorium with 65 members and guests in attendance.

President **Arnold** called the meeting to order at 8:20 P.M. Sergeant-at-arms **Pete Esten** introduced the visitors, and the secretary's and treasurer's report was read and approved. Vice-president **Truman Stoner** introduced two new candidates for membership in the branch and three new members were installed. **Jim Sowell,** general chairman of the Annual Technical Session and Dinner Dance to be held Saturday, March 17, reported that all committees after working hard the past two months were ready for a large attendance, at both the Technical Session and Dinner Dance.

G. Stu Krentel issued an invitation to all interested members to attend the next meeting of the Electrochemical Society which is to be held at Rodger Young on Tuesday, April 3 with dinner scheduled for 6:30 P.M.

Being election night no speakers were scheduled and the following slate of officers were elected to guide the branch for the following year:

President, **L. Truman Stoner;** 1st Vice-President, **George Magurean;** 2nd Vice-President, **Norman K. McEwan;** Secretary, **Frank Virgil;** Treasurer, **George J. Hetz,** Librarian, **Emmett Babcock.** Board of Managers: **Earl W. Arnold, Harvey Hunt** and **Tony Stabile.** Delegates: **Marty Barsoom, Emmett Babcock** and **G. Stu Krentel.** Alternates: **Jack Beall, Kenny Johnson** and **Tony Stabile.**

After the elections, meeting was adjourned at 9:45 P.M.

G. J. HETZ
Secretary

LOUISVILLE

Andrus on Decorative Anodizing

The regular monthly meeting of the Louisville branch AES was held Thursday, February 16, at Kapfhammers Party House, Louisville, with a dinner served at 6:30 P.M. 1st vice-president, **Ken C. Reifsteck** opened the business and open meeting at 8:00 P.M. with 27 members and guests present.

The minutes of the previous meeting was read and accepted.

The technical sessions chairman, **J. S. Houston,** reported that the speaker for the next meeting will be **Charles E. Kimmel** of the Dow Chemical Company, Midland, Michigan.

Application for membership was received from **Thomas M. Brentlinger,** Louisville, Kentucky; **Hugh C. Barnes,** Louisville, Kentucky.

A letter was received from **G. A. Logsdon** who wishes to tender his resignation effective March 31, 1956.

A letter came from **P. Peter Kovatis,** Executive Secretary, requesting a list of the plating plants in our area both captive and independent. Vice-president K. C. Reifsteck selected **S. J. Beyer** and **J. G. Sterling** to take care of this item.

A letter was received from the Cincinnati branch requesting J. G. Sterling to be a member of the 1958 National Convention Committee for Cincinnati, Ohio. The Louisville branch AES has agreed to this proposition.

Ed Bruck of the Indianapolis branch gave us a report on the Regional meeting to be held in Indianapolis, Ind. next year. There also will be a Banquet and Technical Session held on April 28, and tickets are available at $7.50 per person.

R. G. Marshall reported that at this time a junior delegate is to be appointed by the Louisville branch for the new Regional Meeting which will be held in Indianapolis in 1957. K. C. Reifsteck was elected.

K. C. Reifsteck 1st vice-president nominated the following to act as the nominating committee for the new officers for the fiscal year, April 1, 1956 to April 1, 1957. **S. J. Beyer**—Chairman **J. W. Scholl** and **Duke T. Scott.**

Andrus

The meeting was turned over to the technical sessions chairman, **J. S. Houston** who introduced the speaker **J. M. Andrus**—finishing superintendent of the Croname Inc., Chicago, Ill. Andrus, in his talk on "Decorative Anodizing," gave an instructive and educational session in anodizing of film and color on various products which were passed around.

Considerable discussion followed and Andrus was given a rising vote of thanks for a very interesting talk.

The meeting was adjourned at 10:00 P.M.

J. G. Sterling
Secretary and Treasurer

MILWAUKEE

Three Prominent Speakers for Annual Meeting

The 467 regular meeting of the Milwaukee branch was called to order by president **H. Tessman** with approximately sixty members and guests present. The secretary read a letter from **P. Peter Kovatis** who commended the fine editorial material in the branch's monthly publication "Newsleaf." After the reading of other correspondence, **L. Diveley** reported that the annual meeting was shaping up and that the speakers would include: **Clarence Sample,** International Nickel Co., **Dr. Saltonstoll,** and **Lloyd Gilbert** from the Rockford Arsenal. The subject of Finishing Specifications, theme of the meeting, would be of importance to every metal finisher.

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Historian **H. Bornitzke** announced that the history of the branch which he is compiling is under way and that many serious problems of the old days were humorous to modern platers. (Such as—whose turn it was to crank the generator or, will generators replace the battery in the plating room?).

A partial list of delegates was announced and is: **P. Ritzenthaler, L. Diveley, H. Tessman,** and **J. Durnford.**

The nominating committee report was given by P. Ritzenthaler and is: President, **H. Tessman;** 1st Vice-President, **E. H. McCoy;** 2nd Vice-President, **G. Einberger;** Secretary-Treasurer, **S. Tatereczynski;** Librarian, **L. Diveley;** Board of Managers, **G. Schwemmer.**

The president appointed **S. Choren** sergeant-at-arms, with the hope that the new officer could round up the members in time to start the meeting at the 8:00 P.M.

Librarian **J. Severson** introduced the speaker for the evening: **Ed Stanek** of the Belke Mfg. Co. Stanek spoke about the latest developments in the plating equipment field, both for automatic or manual operations. The various uses of plastisols for rack coatings and for hoods and ducts were also covered in his short speech. The meeting was adjourned and refreshments were enjoyed through the courtesy of the Belke Co.

C. PETER
Secretary

MISSISSIPPI VALLEY

Kotz on Racks; Permanent Charter Coming Up

The March 21 meeting of the Mississippi Valley branch was held at the Tower Restaurant. The meeting was preceded by a dinner which was served at 6:30 P.M.

The regular meeting was called to order at 8:00 P.M. by **L. O. Gilbert,** president, who turned the meeting over to **John Hartman,** librarian. Hartman introduced the speaker of the evening, **Raymond Kotz** of Belke Manufacturing Co.

Kotz gave a history of racks from the drude cast iron rack of years ago to the highly efficient rack of today. He gave details of modern design. One square inch in cross section of copper is required for each 1000 ampere. Rubber may be used for insulation except in chromium plating where vinyl plastisol is used. Some racks are insulated with Kel F which is also satisfactory in alkalies. In the manufacturing, racks are first sand-blasted then given a prime coat, then an intermediate coat, heated and finally dipped in vinyl plastisol. This latter coat is baked on at 375° F. The care of racks is important for their long life and efficient operation. In handling, caution should be taken not to puncture the insulating coating. Prongs should not be bent too far as fracture of the coatings at the point of attachment might occur. Care should also be taken to retain gloss on vinyl covered racks to minimize dragout. In repairing punctures in vinyl coatings, a putty like material may be prepared by partially baking a small amount of vinyl plastisol. This substance may be forced into the puncture after which it is baked in. This may be done with a gas torch with not too hot a flame. It is very important not to use too much heat. Acetylene torches should not be used. The best method of removing plastisol, is to burn it off. Titanium is the racking material of the future. While the initial cost is greater, the prolonged life more than compensates for it. Titanium is resistant to all plating solutions.

Kotz circulated a large number of racks for our observation.

A discussion period followed which lasted thirty-five minutes.

Kotz was thanked for his fine talk by the president.

The secretary was asked to read the minutes of two recent executive meetings, and the February meeting.

Gilbert stated that by-laws are in the process of being prepared and that the entire membership will receive a copy.

USE READER SERVICE CARD; INDICATE A 594.

The program for future meetings was related which will include talks on metal cleaning, plating die castings, stream pollution prevention. It is planned that our June meeting will be devoted to the presentation of the Permanent Charter with a talk by the National President, **Clyde Kelly**.

A motion was made by **Paul Chamberlain** that dues for members in the armed forces be defrayed. This was seconded and approved by a voice vote.

Lloyd Dunn of Wyandotte Chemical complimented us on our meeting and large attendance, and invited us to visit meetings of the Chicago branch. They meet the second Friday of each month.

Barney Nordblom showed a movie prepared by Stevens on Automatic Barrel Plating. He also showed an entertaining film prepared by Winchester on trick shooting. It featured **Parsons**, a well known marksman.

The executive group remained briefly to sign the application for Permanent Charter.

The meeting adjourned at 10:30 P.M.

PAUL G. CHAMBERLAIN
Secretary-Treasurer

NEW HAVEN

Dr. Dubpernell on Crack-Free Chromium

A regular meeting was held on March 13, at the Mason Laboratory, Yale University.

President **William K. Murray** opened the meeting with the roll call of officers. More than 40 members and guests were present.

The Regional Committee gave a report on the status of this event and it promises to be a great success.

The following nominating committee was appointed to present a slate of candidates for the consideration of the membership at the April meeting: **Walter Lynch**, chairman, **James Creamer, Dr. Henry Kellner, John Barry** and **Edward Busby**.

The following new membership for application was read and accepted: **Albert J. Kolb.**

Technical chairman **Harry Taylor** then introduced the speaker of the evening, **George D. Dubpernell** of the United Chromium Division of Metal and Thermit Corp., Detroit, Michigan. Dr. Dubpernell's subject was "Crack Free Chromium Plating." His subject is of great interest to the New Haven branch membership and his presentation was informative and interesting. His talk was supplemented with slides and plated specimens. The question and answer period produced one of the longest sessions in the branch history. Dr. Dubpernell was subjected to a barrage of questions on all phases of both practical chromium plating as well as laboratory techniques and testing methods. At the end he was accorded a well deserved rising vote of thanks.

The door prize was donated by United Chromium Corp.

B. J. GAFFNEY
Secretary

NEW YORK

New Officers; Much Interest

The February 24 meeting was held at the Hotel Statler, N. Y. and was called to order by **A. Fusco** president.

The following applications were presented for membership into the Society: **Rothstein, Goldwasser, Young, Poole, Andros**, and **Forman.**

Nominations of officers for the coming year was held and the following were nominated: President, **D. Hartshorn Jr.**; 1st Vice-President, **I. Goldwasser**; 2nd Vice-President, **E. Saubestre**; Secretary-Treasurer, **M. Nadel**; Recording Secretary, **L. Levinson**; Librarian, **G. Herrmann**; Sergeant-at-Arms, **J. Weiner**; Financial Secretary, **R. Laguori**; Board of Managers, **Fusco, J. Stremel**; Delegates to the Convention; **Fusco, Nadel**, and **Mac Stoker.**

These nominations and any others may be presented at the first meeting in March. At which time the nominations will be closed and then voted upon.

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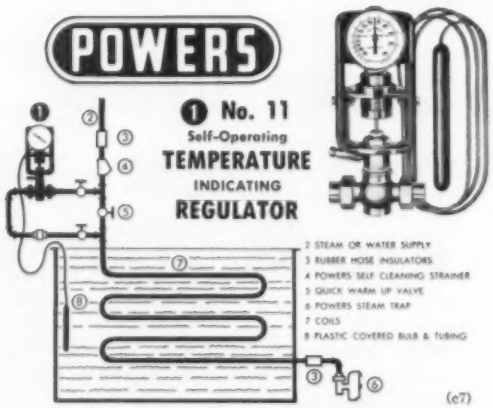

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Plating Staff Photo

National Past President Cleve F. Nixon congratulates Derick Hartshorn, new president of the New York branch at the March 23 meeting where Nixon was the featured speaker. Looking on are other newly elected officers (left to right) Milton Nadel, secretary-treasurer; Joseph A. Rembecki, librarian; Hartshorn; Nixon; Edward B. Saubestre, first vice-president; George F. Herrmann, second vice-president. (Absent when photo was taken: Ralph J. Liguori, financial secretary and A. Briganti, recording secretary)

There being no other business Fusco then turned the chair over to our librarian E. Saubestre who in turn presented **L. A. Greiner** of the Mine Safety Appliance Co. Greiner spoke on "Safety in the Plating Shop." His talk centered on the use of respirators and masks in hazardous occupations. He pointed out that the plating industry is not especially dangerous, partially in view of existing ventilation requirements. However applications for protective devices exist where dry compounds, such as alkaline cleaners are being transferred, or where tanks are being cleaned. The talk provoked a lively question period afterwards.

LESTER LEVINSON

SAGINAW VALLEY

Three Talks During Board of Managers Meeting

The March 14 board of managers meeting of the Saginaw Valley branch of the AES was held at the Michigan House, Bay City, Mich.

There were sixty men present at this meeting. The door prize was donated by Harshaw Chemical Co. and won by **S. E. Beauregard** of Hanson-Van Winkle-Munning Co.

The guest speakers were **Stewart Harger,** who spoke on "Rinsing After Chrome Plating;" **Robert Brink** who spoke on "Waste Disposal," and **Dennis Goddeyne** on "Nickel and Chrome Plating on Magnesium."

ALFRED KNIGHT

WICHITA

Kelly Speaks; Another Swift is President

For the second time in our brief history the Wichita branch of the AES was honored by a visit from the National President. It is seldom indeed that we are honored with a visit from one we are sure has more pressing matters at hand. Unfortunately, as fate would have it, **Clyde Kelly's** visit conflicted with a four-day holiday weekend, Good Friday and Easter, plus the fact that the regular meeting date was changed from Wednesday to Friday. Nevertheless, seventeen fortunate members were able to hear his address.

Kelly spoke of various and far-flung societies that exchange memberships and ideas with the AES. He also commended the superior Headquarter personnel. He advised us that the AES is publishing a handbook on plating (Process Control). We were informed that the Society is planning courses in instruction of plating, (choosing members as instructors) and he referred specifically to **Dr. Heiman's** article on setting up such courses. He suggested that we set up a research finance chairman soliciting sustaining members and suggested we contact him for further information on this set-up.

Everyone was particularly well pleased with Kelly's presentation and we were somewhat reluctant to see him leave for Des Moines.

ALVIN SMITH

On Monday, February 27, 1956, **Alvin Smith,** sales manager of Imperial Rack Co., Inc., Flint, Mich., died suddenly of a heart attack.

Smith was 57 years old and a well-known personality in the plating and finishing field. He had been employed by Imperial Rack Company for over five years, and headed their plating-rack and fixture sales.

Smith was also an active member of the Saginaw Valley Branch of the AES.

This picture of Clyde Kelly, giving his address to the Wichita branch on March 30, was taken by a former member of the Branch. Arvid A. Melby, Past President. **Melby** not only took the picture but developed it as well

Our annual elections were held and the following new officers were installed. **F. B. Swift,** President; **Leon Lawless,** Vice-President; **Glenn Summers,** Secretary; **Earl Spangler,** Treasurer; **Eldon Van Meter,** Librarian; **Jim Lewis** and **Jack Pirrone,** three-year Board Members.

B. F. Swift,
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(Changes Only)

CAPITOL DISTRICT meets first Monday of each month at Panetta's Restaurant, Menands, N. Y. at 7 P.M. for dinner; 8 P.M. for educational session. Secretary, Edward V. Raymond, Broadlawn North Street, Cheshire, Mass. Research finance committee chairman, Chester R. Klimek, 16 Southern Avenue, Pittsfield, Mass.

LOS ANGELES meets second Wednesday of each month at 7 P.M. in Rodger Young Auditorium; meeting 8 P.M. Secretary, Frank Virgil, 3628 East Olympic Boulevard, Los Angeles 23, Calif. Research finance committee chairman, Kenneth C. Johnson, 816 W. 5th Street, Suite 806, Los Angeles 17, Calif.

MELBOURNE meets third Thursday of each month at 7:30 P.M. at Metallurgy Theatre, Melbourne Technical College, 124 Latrobe Street. Honorary secretary-treasurer, B. D. Reaburn, Park Road, Ringwood, Victoria, Australia.

MILWAUKEE meets first Friday of each month at 8 P.M. in the East Room, Hotel Ambassador. Secretary-treasurer, Sylvester R. Taterzinski, 3463 N. Dousman Street, Milwaukee, Wis.

MONTREAL meets first Tuesday of each month at 8 P.M. at Mount Royal Hotel. Secretary-treasurer, William T. Scott, 1430 Dutrisac Street, Apt. 12, Ville St. Laurent, Quebec.

PITTSBURGH meets first Wednesday of each month at 8 P.M. in the Avalon Room of the Sherwyn Hotel. Secretary, F. W. Stevens, 79 Summit Avenue, Ellwood City, Pa. Research finance committee chairman, Myron Ceresa, 207 Highland Road, Pittsburgh 35, Pa.

SAGINAW VALLEY meets at Zehnder, Frankenmuth, Mich., second Wednesday of each month, September through May, except February, at 7 P.M. Secretary-treasurer, Douglas T. Rewbotham, 616 E. Baker Street, Flint 5, Mich.

ST. JOSEPH VALLEY meets first Wednesday of each month at the L. H. Inn, Mishawaka, Ind., at 6:30 P.M. for dinner and 8 P.M. for technical session. Secretary-treasurer, Henry A. Meers, 2001 Bergan Street, South Bend, Ind. Research finance committee chairman, Arthur Wiegand, 181 N. Elkhart Avenue, Elkhart, Ind.

SOUTHEASTERN meets second Friday of each month at 7:30 P.M. at the Belmont Steak House, Atlanta, Ga. Secretary-treasurer, Robert H. Probert, Box 2410, Georgia School of Technology, Atlanta, Ga. Research finance committee chairman, Clem Hohner, 1841 Cheshire-Bridge Road, N. E., Atlanta, Ga.

SPRINGFIELD meets fourth Monday of each month from September through May, except December, at Blakes Restaurant, 15 Market Street, Springfield, Mass. Secretary, Henry L. Heissfeld, 74 Chilson Street, Springfield, Mass. Research finance committee chairman, John E. Costigan, 74 Clairmont Place, Longmeadow, Mass.

TOLEDO meets first Thursday of each month at Angelo's Spaghetti House, Stickney Avenue, Toledo, Ohio for dinner at 6:30 P.M. and for technical session at 8 P.M. Secretary-treasurer, G. H. Bergeman, 703 Pine Street, Fremont, Ohio.

WATERBURY meets second Thursday of each month at the Colonial Room of the Hotel Elton, Waterbury, Conn., for dinner at 6 P.M., business at 7 P.M. and educational meeting at 8 P.M. Secretary-treasurer, Albert G. Griffith, 94 Ridgeview Place, Cheshire, Conn. Research finance committee chairman, Francis X. Bergin, 25 Steuben Street, Waterbury, Conn.

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FURTURE MEETINGS

AES

May	5—Annual Regional Meeting, Toronto Branch, Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada.
May	5—20th Annual Banquet and Technical Session, Boston Branch, Hotel Statler, Boston, Mass.
June	17-21—43rd Annual Convention of the AES, Hotel Statler, Washington, D. C.
June	18—Branch Secretaries' Meeting, California Room, Hotel Statler, Washington, D. C.
June	18—AES Editorial Board Meeting, Massachusetts Room, Hotel Statler, Washington, D. C.
June	19—Branch Librarians' Meeting, California Room, Hotel Statler, Washington, D. C.
June	19—AES Research Committee Meeting, Massachusetts Room, Hotel Statler, Washington, D. C.
June	20—AES Public Relations Task Committee Meeting, Massachusetts Room, Hotel Statler, Washington, D. C.
June	17-20, 1957—44th Annual Convention of the AES, Sheridan-Mt. Royal Hotel, Montreal, Canada.
May	19-22, 1958—45th Annual Convention of the AES, Sheraton-Gibson Hotel, Cincinnati, Ohio.

INTERSOCIETY

May	3-9—American Foundrymen's Society, Annual Convention, Atlantic City, N. J.
May	4—3rd Annual Conference for Engineeers, Ohio State University, Ohio.
May	7-11—American Welders Society, Spring Meeting, Hotel Statler, Buffalo, N. Y.
May	8-11—ASME Metals Engineering, AWS Conference, Hotel Statler, Buffalo, N. Y.
May	9-10—National Association of Corrosion Engineers, Symposium, University of Buffalo, Buffalo, N. Y.
May	14-17—ASME Design Engineering Conference, Convention Hall, Philadelphia, Pa.
May	15-17—11th Purdue Industrial Waste Conference, Purdue Memorial Union, Lafayette, Indiana.
May	23-26—ASME-EIC Meeting, Mount Royal Hotel, Montreal, Quebec, Canada.
June	3-8—SAE Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
June	6-8—American Society for Quality Control, 10th Annual Convention and Exposition, Palais Du Commerce, Montreal, Canada.
June	11-15—7th National Plastics Exposition, Society of The Plastics Industry, N. Y.
June	17-22—59th Annual Meeting ASTM, Chalfonte-Haddon Hall, Atlantic City, N. J.
September	16-22—ASTM Electroplating Practices Symposium, West Coast Meeting, Hotel Statler, Los Angeles, California.
September	16-22—2nd ASTM Pacific Area National Meeting, Hotel Statler, Los Angeles, California.

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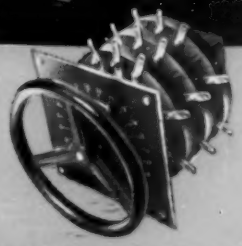

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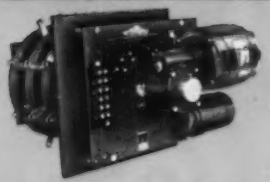

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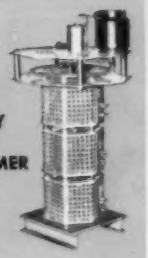

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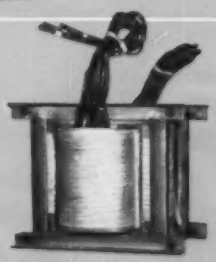

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The selection of the proper controls with either selenium or germanium rectifiers can be the key to improving your plating and anodizing results. For every installation there is a control which will best fit the application. Let H-VW-M make an engineering survey and recommend the most suitable control to give you not only the best results, but also the maximum in efficiency, flexibility, and economy.

APPLICATION SUGGESTIONS

Use	Recommended Control
Batch Tank Plating	Manual tap switch.
Batch Tank Plating with wide load variations and high production	Motor operated variable auto-transformer or motor operated tap switch.
Barrel Plating	Manual tap switch. No control rectifier.
Cleaning & Pickling	Manual tap switch. No control rectifier.
Conveyor—many stations	Manual tap switch (remote control). Motor operated tap switch. Saturable core reactor. Motor operated continuously variable auto-transformer.
Conveyor—few stations	Automatic voltage stabilization with variable auto-transformer. Automatic voltage stabilization with saturable core reactor.
Chrome strike in combination with Plate	Automatic programming with variable auto-transformer or special series hook-up.
Sulphuric Anodizing	Manual tap switch. Motor operated tap switch. Saturable core reactor.
Color Anodizing	Automatic constant current with variable auto-transformer. Automatic constant current with magnetic amplifier and saturable core reactor.
Chromic Anodizing	Automatic programming with variable auto-transformer. Combination automatic constant current and automatic voltage stablization with variable auto-transformer or saturable core reactor.
Electrolytic Metal Refining	Automatic current control with saturable core reactor.

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